Emera Astronomy Center
and M. F. Jordan Planetarium

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Cosmic Classroom Guide

THE LITTLE STAR THAT COULD

COMPILED & EDITED BY LEISA PREBLE

THE UNIVERSITY OF MAINE
A Member of the University of Maine System

Emera Astronomy Center
and M. F. Jordan Planetarium

The Little Star that Could

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Mission Statement:
The mission of the Maynard F. Jordan Planetarium of the University of Maine is to provide the University and the public with educational multi-media programs and observational activities in astronomy and related subjects.

Cosmic Classroom 

Looking for fun and interesting space activities? The planetarium staff has prepared a collection of materials we call the Cosmic Classroom for you to use before and/or after your visit. These materials are entirely for use at your own discretion and are not intended to be required curricula or a prerequisite to any planetarium visit. The Cosmic Classroom is one more way that the Jordan Planetarium extends its resources to help the front line teacher and support the teaching of astronomy and space science in Maine schools.

The lessons in this Cosmic Classroom have been edited and selected for the range of ages/grades that might attend a showing of this program at the Jordan Planetarium. Those activities that are not focused at your students may be adapted up or down in level. Our staff has invested the time to key these materials to the State of Maine Learning Results in order to save you time.

The State of Maine Learning Results performance indicators have been identified and listed for the program, the Cosmic Classroom as a package, and each individual activity within the package. The guide also includes related vocabulary and a list of other available resources including links to the virtual universe. We intend to support educators, so if there are additions or changes that you think would improve, PLEASE let us know.

Thank you, and may the stars light your way.

The Maynard F. Jordan Planetarium Staff

The Program – *The Little Star that Could*

In this lively program, characters come alive as the different colored stars of the nighttime sky and the planets of the Solar System are explored. During the show, the audience is introduced to Little Star a small yellow star in search for planets of his own to protect and warm. Along the way, he meets other stars, learns what makes each star special, and discovers that stars combine to form star clusters and galaxies. Eventually, he finds his planets and the students are introduced to each of his planets and learn some basic information about our Solar System

We are very glad that you have chosen to visit our planetarium with your group. We hope that this guide either will help you prepare your group or help you review their experience at the University of Maine's sky theater.

State of Maine Learning Results Guiding Principles

The lessons in this guide, in combination with *The Little Star That Could*, will help students to work towards some of the Guiding Principles set forth by the State of Maine Learning Results. By the simple act of visiting the planetarium, students of all ages open an avenue for self-directed lifelong learning. A field trip encourages students to think about learning from all environments including those beyond the schoolyard. A Jordan Planetarium visit also introduces visitors to the campus of the largest post-secondary school in Maine and encourages them to think of this as a place which holds opportunities for their future education, enjoyment and success.

Other sites on the University campus, including three museums, explore a variety of subjects, and the Visitors Center is always willing to arrange tours of the campus. A field trip can contribute to many different disciplines of the school curriculum and demonstrate that science is not separate from art, from mathematics, from history, etc. The world is not segregated into neat little boxes with labels such as social studies and science. A field trip is an opportunity for learning in an interdisciplinary setting, to bring it all together and to start the process of thinking. For a more complete discussion of field trips, please visit the Jordan Planetarium web site at http://umainesky.com.

If used in its entirety and accompanied by the Planetarium visit this guide will help students to:

Become **a clear and effective communicator** through

A. oral expression such as class discussions, and written presentations
B. listening to classmates while doing group work, cooperation, and record keeping.

Become **a self-directed and life long learner** by

A. introducing students to career and educational opportunities at the University of Maine and the Maynard F. Jordan Planetarium.
B. encouraging students to go further into the study of the subject at hand, and explore the question of "what if?"
C. giving students a chance to use a variety of resources for gathering information

Become **a creative and practical problem solver** by

A. asking students to observe phenomena and problems, and present solutions
B. urging students to ask extending questions and find answers to those questions
C. developing and applying problem solving techniques
D. encouraging alternative outcomes and solutions to presented problems

Become **a collaborative and quality worker** through

A. an understanding of the teamwork necessary to complete tasks
B. applying that understanding and working effectively in assigned groups
C. demonstrating a concern for the quality and accuracy needed to complete an activity

Become **an integrative and informed thinker** by

A. applying concepts learned in one subject area to solve problems and answer questions in another
B. participating in class discussion

State of Maine Learning Results Performance Indicators

In conjunction with the Maynard F. Jordan Planetarium show *The Little Star That Could,* this guide will help you meet the following State of Maine Learning Results Performance Indicators in your classroom.

Grades PreK-2

Science and Technology –

A2. Models - Students identify models and the objects they represent to learn about their features.

a. Describe ways in which pictures are like the real things they model.
b. Use a model as a tool to describe the motion of objects or the features of plants and animals.

A3. Constancy and Change – Students observe that in the physical setting, the living environment, and the technological world some things change over time and some things stay the same.

a. Describe the size, weight, color, or movement of things over varying lengths of time and note qualities that change or remain the same.

B1. Skills and Traits of Scientific Inquiry – Students conduct and communicate results of simple investigations.

a. Ask questions and make observations about objects, organisms and events in the environment.
e. Use writing, speaking, and drawing to communicate investigations and explanations.

D1. Universe and Solar System – Students describe the movement of objects across the sky, as seen from Earth.

a. Describe how the sun and moon seem to move across the sky.

D3. Matter and Energy – Students use observable characteristics to describe objects and materials and changes to physical properties of materials.

a. Describe objects in terms of what they are made of and their physical properties.

Grades 3-5

Science and Technology –

D1. Universe and Solar System – Students describe the positions and apparent motions of different objects in and beyond our solar system and how these objects can be viewed from Earth.

b. Observe and report on observations that the sun appears to move across the sky in the same way every day, but its path changes slowly over the seasons.
c. Recognize that the sun is a star and is similar to other stars in the universe.

Performance Indicators Snapshot

The Show

Grades PreK-2.

A1.a; A2.a,b; A3.a; B1.a, e; C1.a; D2.a; D3.a

Grades 3-5.

D1.a,b,c; D2.a.

The Guide

Grades PreK-2.

A2.a,b; A3.a; B1.a; D3.a

Grades 3-5.

D1.b, c

The Maynard F. Jordan Planetarium - Cosmic Classroom Activity

Same or Different?

Written by Kim Small

Objectives and State of Maine Learning Results Performance Indicators:

1. Learners will be able to identify three characteristics of planets and stars (each) that are different from one another. (Pre-K. Science and Technology. B1.a, e.)
2. Learners will be able to identify three characteristics that are similar between planets and stars. (Pre-K. Science and Technology. B1.a, e.)

The General Idea: What characteristics of planets and stars are unique? What characteristics are the same? This activity will help students learn how to record and analyze an investigation.

What To Do:

1. Introduction – Have students work in groups of 3 or 4. Give each group a copy of the Planet/Star Venn Diagram. For class discussion, place a master Planet/Star Venn Diagram on an overhead projector. Explain to students that they will be comparing and contrasting planets and stars. Characteristics that are unique to planets will be listed in the "Different" section on the left of the diagram. Characteristics that are unique to stars will be listed on the "Different" section of the right of the diagram. Characteristics that are shared between planets and stars will be listed in the "Same" section in the center of the diagram.
2. Explore prior knowledge - Ask each group to try to list as many answers as possible for each section on the Venn Diagram.
3. Determine student confidence with prior knowledge – By looking at the groups' Venn Diagrams, determine the approximate number of correct answers they have listed in each section of the Venn Diagram.
4. Create a master Venn Diagram – Have each group report their answers to the class. Record all correct characteristics on the master. Have students copy the final master diagram.

What To Discuss:

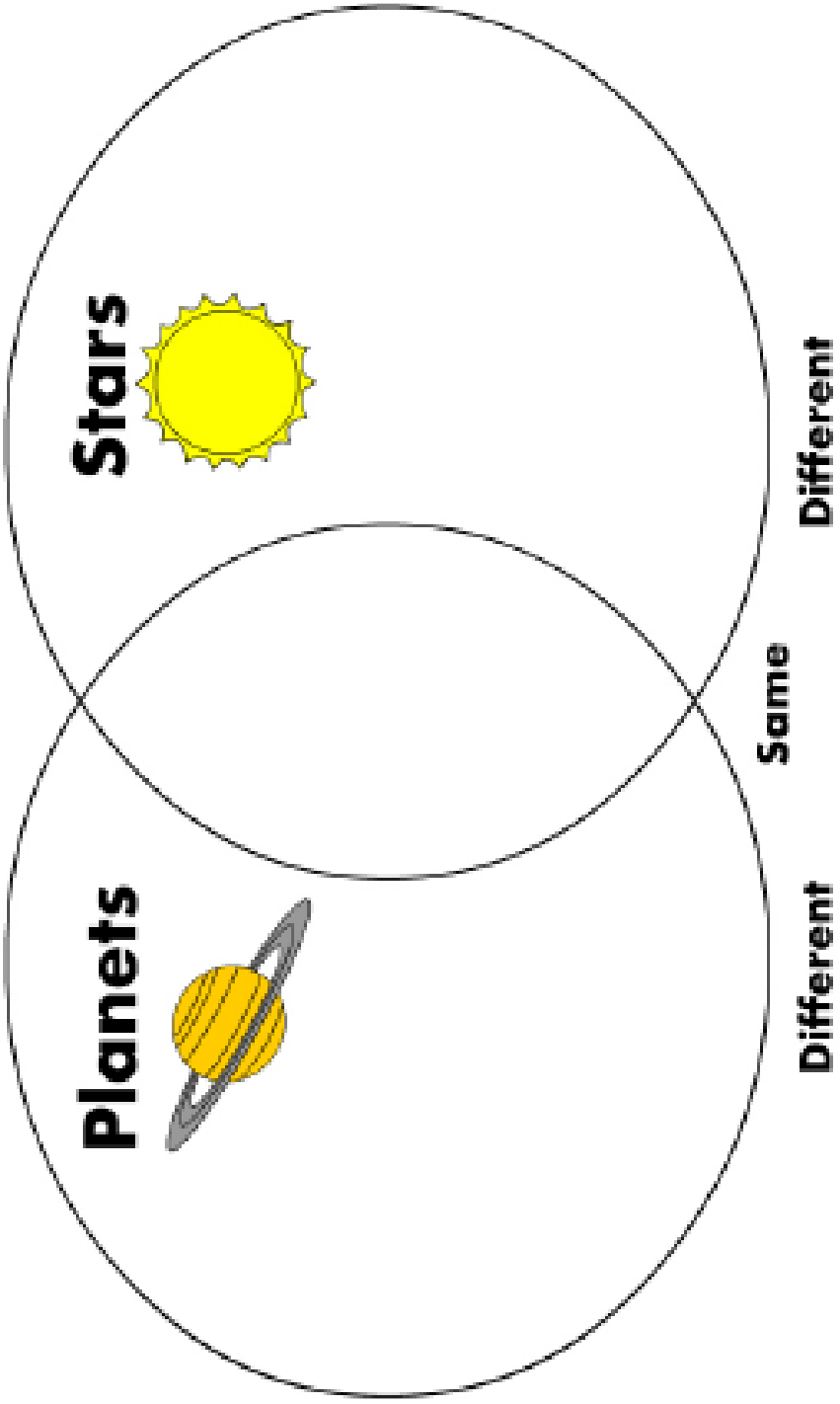
Assessment: Students will independently fill out the assessment Venn Diagram.

Modification/ Accommodations: For students that do not work well in groups, have them work independently during the "exploring prior knowledge" section.

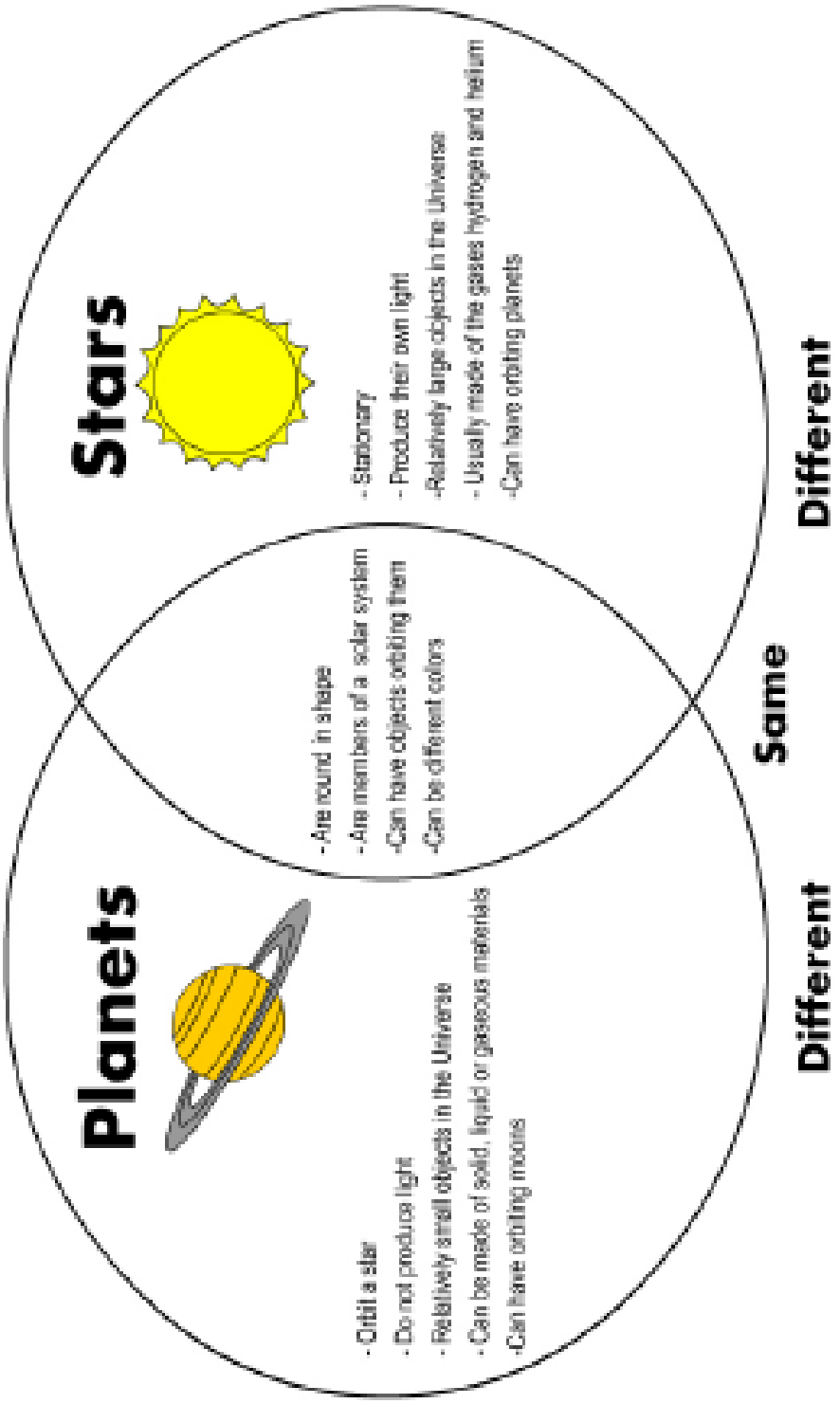
”The Little Star That Could”
Grades K – 2 Education Guide

Name _____Grade _____

Directions: Fill in the Venn Diagram below with three characteristics in each section of the diagram.



Venn Diagram Answer Key
(Some possible answers)



The Maynard F. Jordan Planetarium - Cosmic Classroom Activity

Matching Game

Written by Kim Small

Objectives and State of Maine Learning Results Performance Indicators:

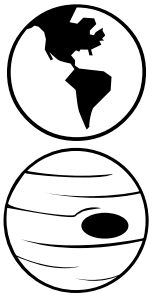
1. Learners will be able to compare two objects in the universe and determine whether they are the same type of object. (Pre. K-2. Science and Technology. D3.a.)
2. Learners will be able to describe the physical properties of celestial bodies and group them based on those properties. (Pre. K-2. Science and Technology. A3.a., D3.a.)

The General Idea:

This activity exercises recognition skills by matching objects in the sky that students may not realize are very similar. An example of this is Sun/star, Earth/planet, and different phases of the Moon. Emphasis can be placed on the idea that even though objects don't always look the same, as a whole they may not be all that different.

Getting Ready:

1. Explain to students that the Sun and stars are shaped like balls, but are often represented with points. This is a good time to show them some drawings of stars and some actual photographs of stars.
2. Explain to students that even though the shape of the Moon doesn't look round all the time, it is always shaped like a ball. A demonstration about moon phases may be helpful here for very young students.
3. Planets look different from one another and are made of different substances, but they are all planets.



What You Need:

- Pictures of the Sun, stars, Earth, planets, and Moon phases.
- Crayons, markers or colored pencils
- Scissors
- 3x5 index cards

What To Do:

1. Have students look at the different pictures and show them how they are the same.
2. Have students color their own versions of the pictures you showed them on the 3x5 cards.
3. You may organize "Match Game" for a class activity, small group, or one-on-one using the cards that the students have constructed. For young students, the pictures themselves may be used and you can do away with step 2 all together.
4. Arrange a mixed group of cards on a table and ask student(s) to pick out which is the Sun/star, Moon or Earth/planet.
5. Arrange a mixed group of cards/pictures and ask student(s) to pick out which is not the Sun/star, Moon or Earth/planet. OR have students make groups of one, excluding all others. (i.e. all planets or all phases of the moon)
6. Repeat as desired with as many cards/pictures as appropriate for the age of your students.

What To Discuss:

1. The Sun is a star, and like all stars, is shaped like a ball. Even though they are sometimes drawn with points, stars are not pointed.
2. The Moon doesn't always look the same, but the different shapes we see repeat again and again over time.
3. Earth is not the only planet, but each of the eight planets are different.

The Maynard F. Jordan Planetarium - Cosmic Classroom Activity

Stars Give Off Light

Based on Stars give off light. The moon and planets reflect light. by Susan Reynolds and Onondaga-Cortland-Madison Board of Cooperative Educational Services math, Science and Technology.

Objectives and State of Maine Learning Results Performance Indicators:

1. The learners will be able to demonstrate an understanding that moons and planets get their light from stars. (3-5. Science and Technology. D1)
2. The learners will be able to show that the Sun is a star. (3-5. Science and Technology. D1.c.)
3. The learners will be able to describe the effects of the Sun's light on how we see other stars during the day.

The General Idea:

To the untrained eye, the night sky is ablaze with the light of thousands of tiny dots. From here on Earth it is sometimes hard to tell the stars from the planets. This activity will help students understand that while both the stars and planets appear to shimmer in the night sky, they are very different objects indeed.

Getting Ready:

- Provide half of the students with Styrofoam balls of varying sizes and the other half with flashlights of varying brightness.

What You Need:

Styrofoam ball
Flashlights
Slide projector
Penlight

What To Do:

1. Hand out the Styrofoam balls and flashlights
2. Darken the room
3. Have the students with the flashlights (the "Stars") shine away from the Styrofoam balls (the "planets")
4. Now have the "stars" shine ON the "planets"

What To Discuss:

1. Are the "planets" easy to see?
2. Is it easier to see the "planets" with the "stars" shining on them?
3. Do moons and planets give off light of their own?

What To Do:

1. Have a students hold a penlight next to a an unlit slide projector
2. Ask the students how easy it is to see the light from the penlight (easy)
3. Turn on the slide projector (warn students NOT to look into the light from the slide projector because it could hurt their eyes)
4. Ask the students if it's still easy to see the penlight or if they can see it at all now (no)

What To Discuss:

1. Why couldn't we see the penlight as well when the projector was on?
2. If the slide projector is the Sun and the penlight is a star, what effect does the Sun have on our ability to see stars during the day?
3. Why can't we see stars during the day?

Extensions/Continuations:

1. Have students create "legends" about why we cannot see stars during the day, perhaps putting them together into a class book or a book for the library.

The Sun Appears to Rise and Set

Based on The Sun Appears To Rise in the East and Set in the West by Susan Reynolds and Onondaga-Cortland-Madison Board of Cooperative Educational Services math, Science and Technology.

Objectives and State of Maine Learning Results Performance Indicators:

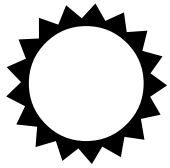
1. Learners will be able to observe that the Sun appears to be in different places in the sky at different times of the day (Pre.K-2. Science and Technology. D1.a.)
2. Learners will be able to demonstrate that the above occurs because the Earth is rotating. (3-5. Science and Technology. D1.b.)
3. Learners will be able to use a model to represent the Sun rising (Pre. K-2. Science and Technology. A2.b.)

The General Idea:

This activity is designed to disprove the geocentric idea that many young students have, the idea that the Sun must be going around us because of how it rises and sets. Through observations of the Sun (please make sure that all you students know that it is dangerous to look directly at the Sun!) and its path through the sky and through teacher demonstration, students will learn how day and night are the result of the Earth rotating rather then the Sun revolving.

Getting Ready:

- Prepare journals for the students to record their observations in
- Set up a light for the demonstration, a bare bulb works well



What You Need:

A journal for each student
A lamp with a bare bulb

What To Do:

1. Take the students outside at a set time (9am is good to start) and have them mark in their journals where the Sun is (again, warn students to ***never*** to look at the Sun because it will harm their eyes).
2. Repeat step one at least twice more (11 am and 2pm for instance).

What To Discuss:

1. Was the Sun in the same place each time we looked at it?
2. Why or why not?
3. Did the Sun move or did the Earth move?

What To Do:

1. Have the students stand in a circle around the lamp (while it is turned off).
2. Explain how scientists use models to discover how things happen and how you are going to use a model to discover how the Sun appeared to move in the sky.
3. Tell the students that they are the Earth and that the lamp is the Sun.
4. Have the students turn so that their left side is in the light
5. Tell the students to pretend that it is Sunrise.
6. While staying in the same spot, have the students turn ***slowly*** to their left until their backs are bathed in light.

What To Discuss:

1. Even though it's nighttime on their faces, is it nighttime on the students backs?
2. Did they all see how the "Sun" came up on one side of their face and went down on the other?

Continuations/Extensions:

1. Do the above activity with a globe. You may also want to mark your state with a bit of clay so that the students can watch as it goes from day to night.

The Maynard F. Jordan Planetarium - Cosmic Classroom Activity

The Sun Is a Star

Based on The Sun is a daytime star. by Susan Reynolds and Onondaga-Cortland-Madison Board of Cooperative Educational Services math, Science and Technology.

Objectives and State of Maine Learning Results Performance Indicators:

1. Learners will be able to identify objects that are in the daytime and nighttime sky. (PreK-2. Science and Technology. D1.a)
2. Learners will be able to identify the Sun as the only star visible during the day. (3-5. Science and Technology. D1.c.)
3. Learners will be able to recognize that the sun is a star and is similar to other stars in the universe. (3-5. Science and Technology. D1.c.)

The General Idea:

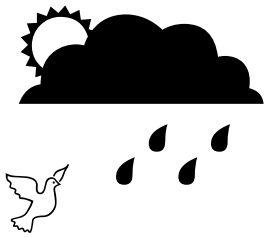
When discussing astronomy we often mention the Sun, moons, stars and planets, but for many young students this may inadvertently cause them to believe that the Sun is not a star. The following activity is designed to help students remember that the Sun is a star we can see during the day.

Getting Ready:

- Ask the students to think about, and discuss, when the Sun can be seen.

What You Need:

Paper
Crayons
Markers
Sunny day



What To Do:

1. Take the students outside on a Sunny day to observe the daytime sky (before going outside, emphasize to the students that they should ***never*** look directly at the Sun because it could hurt their eyes)
2. Have the students write down, or write down for your students, what they see out during the day
3. Talk to the students about what they think the Sun is, what it's made of, etc.
4. Explain that stars are made of the same things that the Sun is made of; that the Sun is the same as many of the stars we see at night. In fact, the Sun is a star that is closer to us than all other stars and that's why it looks so much bigger.

5. Have students make a list of what they see at night and have a class discussion about the differences between this list and the list of things they see during the day.
6. Have each student fold a piece of paper in half
7. Have students draw the daytime sky on one side of the piece of paper and the nighttime sky on the other side. Students can use these drawings to remember the differences in the daytime and nighttime sky as well as remembering that the Sun is a star.

What To Discuss:

1. What did you observe in the daytime sky?
2. What did you observe in the nighttime sky?
3. What can be seen in both the daytime and nighttime sky?

The Maynard F. Jordan Planetarium - Cosmic Classroom Activity

Stars Form Patterns in the Sky

Based on Stars can form patterns in the sky. The Big and Little Dippers are examples of star patterns. by Susan Reynolds and Onondaga-Cortland-Madison Board of Cooperative Educational Services math, Science and Technology.

Objectives and State of Maine Learning Results Performance Indicators:

1. Learners will be able to discover that the stars form patterns in the sky. (Pre.K-2. Science and Technology. A2.b.)
2. Learners will be able to make observations about the night sky. (Pre. K-2. Science and Technology. B1.a.)
3. Learners will be able to use pictures to represent the constellations (Pre. K-2. Science and Technology. A2.a.)

The General Idea:

Standing under the sky on a dark night and gazing at the stars is an incredible sight. But how do we tell the difference between this star and that? As adults we use constellations to more easily identify stars and groups of stars. This idea of stars making a picture correlates with young students love of dot-to-dot pictures. After students have become familiar with activities such as dot-to-dot's and geo-boards, you can use the following activity to link these mathematical concepts with science.

Getting Ready:

- Familiarize students with dot-to-dot puzzles and geo-boards

What You Need:

Black construction paper
Popcorn
Glue or paste
Crayons, chalk, etc.

What To Do:

1. On a sheet of black construction paper, have the students put dots of glue or paste at random
2. Have the students place pieces of popcorn on the glue or paste to form a "constellation".
3. When the glue or paste has dried, students can connect the "dot's" of popcorn with chalk or crayon to show others what their constellation looks like

What To Discuss:

1. How are the students "constellations" like the ones in the sky? How are they different?

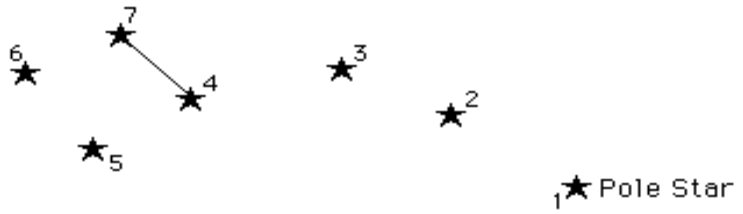
Continuations/Extensions:

1. For older students, have them write a story about their constellation
2. Take photocopies of known constellations and have the students draw their own picture of the constellation (for example, the Big Dipper is part of Ursa Major, the great bear, but students may see a pot, ladle or baseball cap).

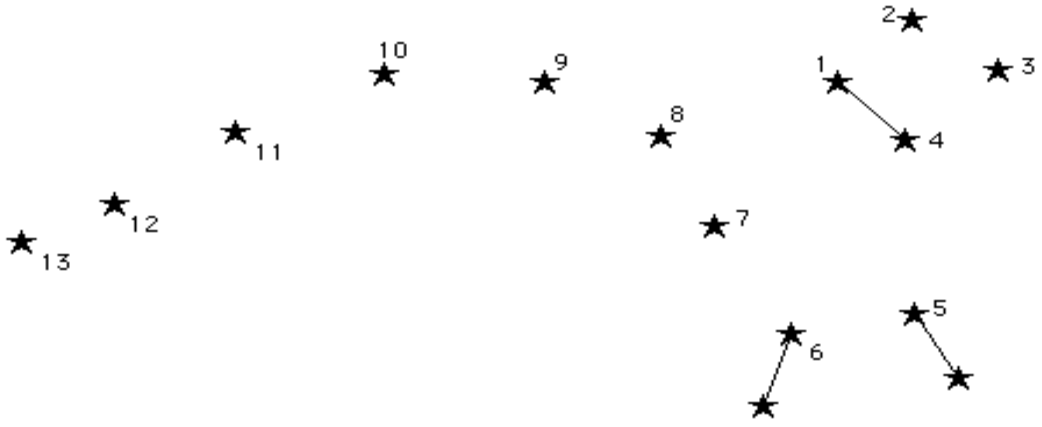
Name_____

Can you connect the stars in number order?

Make the Little Dipper.



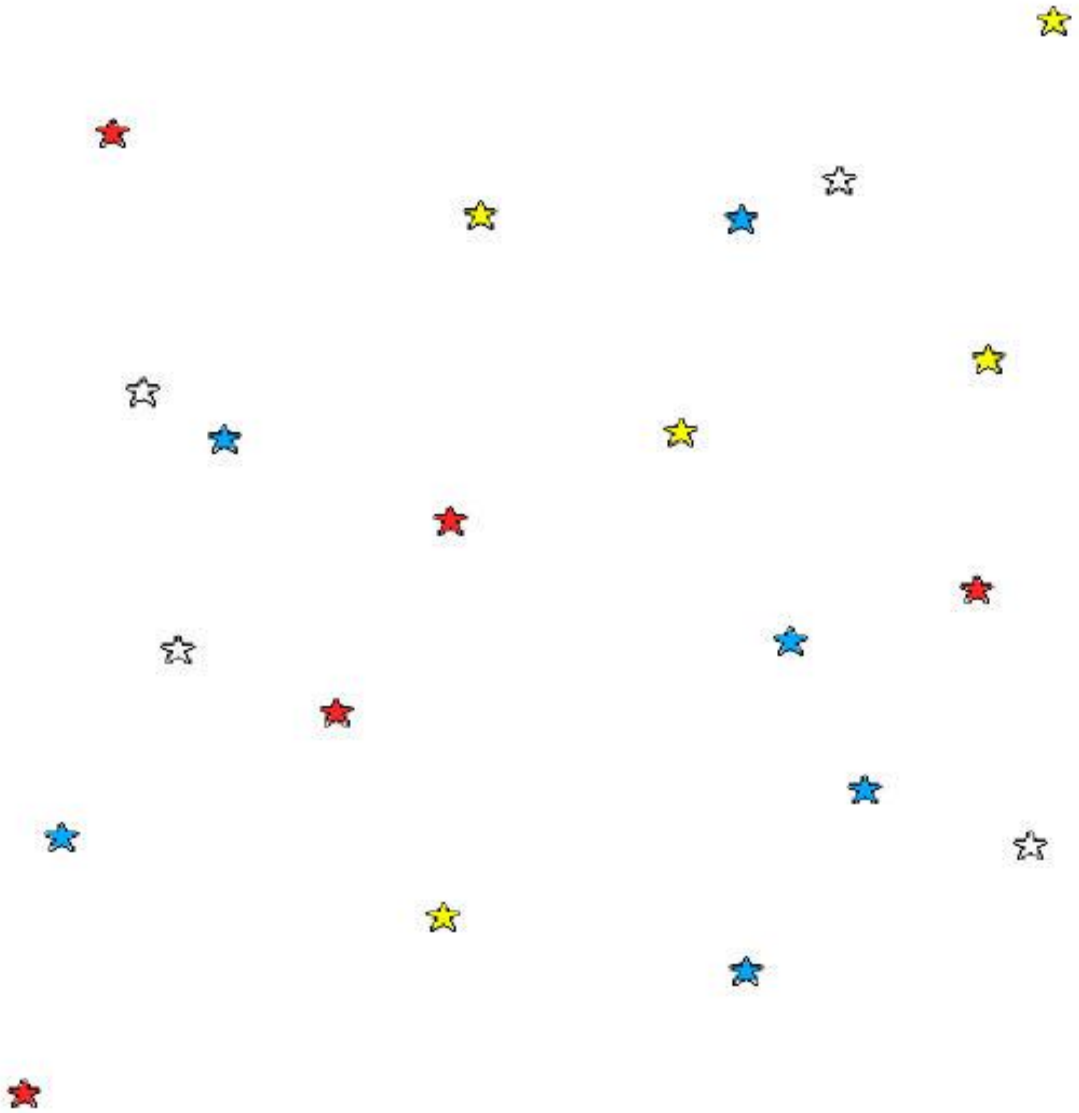
Make Draco, the Dragon.



Your Own Constellation worksheet

Name _____

You can make your own constellations.
Draw lines between some of these stars to make a picture.
What did you draw?
Can you give your constellation a name?
On the back, make up a story involving your constellation and share with your class



Vocabulary List

Average	Being ordinary or usual
Constellation	A grouping of stars, considered by humans to form a picture in the sky. Often related to mythology.
Day	The time it takes for a planet to make one full rotation (on Earth, 24 hours).
Gravity	A force of attraction between particles or bodies that occurs because of their mass, is stronger as mass is increased, and is weaker as the distance between the objects is increased.
Moon	The Earth's natural satellite that shines by reflecting light from the Sun.
Orbit	A specific path followed by a planet, satellite, etc.
Planet	Any of the large bodies that revolve around the Sun in the solar system.
Revolution	The circling of a smaller object around a larger object.
Rotation	The spinning of an object on its axis.
Satellite	A heavenly body orbiting another of larger size.
Solar System	All the objects, and the star they orbit around, in one system.
Star	a. A natural body visible in the sky especially at night that give off light. b. A ball-shaped gaseous celestial body (as the Sun) of great mass that shines by its own light.
Sun	The star around which the planets revolve, from which they receive heat and light.

Some good books to use with *Little Star that Could*

Science project ideas about the moon.
Gardner, Robert. 1997, Enslow Publishers.
Introduces the phases and other characteristics of the moon.

The Magic School Bus: Out Of This World
Posner, Jackie (adaptation). Illu. By Robbin Cuddy. 1996, Scholastic Inc.

I Didn't Know The Sun is a Star
Petty, Kate. 1997, Copper Beech Books

Is There Life in Outer Space?
Branley, Franklyn M.; Illustrated by Edward Miller. 1999. HarperTrophy (revised edition)

The Big Dipper
Branley, Franklyn M.; Illustrations by Molly Coxe. 1991. HarperTrophy (revised edition)

Some good web sites to use with *Little Star that Could*

starchild.gsfc.nasa.gov/docs/StarChild/StarChild.html
Starchild is a learning center for Elementary age astronomers.

www.heavens-above.com
Heavens Above, an Astronomical web site with current sky maps, along with information on how to observe satellites from your backyard, including the International Space Station!

Lessons From The World Wide Web

Also, a wide variety of lesson plans and activities can be found on the World Wide Web. These sites are dedicated to lesson planning in a variety of subjects.

amazing-space.stsci.edu
Amazing Space a site with lots of Web-based activities designed for classroom use and for the general public.

cse.ssl.berkeley.edu
The Center for Science Education at U. C. Berkeley Space Science Laboratory home page with a link to the Science Education Gateway, Lesson Plans

btc.montana.edu/ceres
Maintained by the Burns Telecommunications Center, this page links to educational activities and classroom resources.

spaceplace.jpl.nasa.gov/spacepl.htm
This California Institute of Technology and NASA Jet Propulsion Laboratory site for kids offers information and activities.

Astronomy Web Sites Worth a Visit

Astro.umaine.edu
The Emera Astronomy Center and the Maynard F. Jordan Planetarium & Observatory home page.

jpl.nasa.gov
NASA's Jet Propulsion Laboratory web site

ssd.jpl.nasa.gov
A site about our solar system maintained by the Solar System Dynamics Group of the Jet Propulsion Laboratory.

www.clearsail.net/students.htm
School/Student links from the ClearSail student fun and research site

www.dustbunny.com/afk
A web site about astronomy, designed for kids, with tons of information

hawastsoc.org
The Hawaiian Astronomical Society's home page

www.nss.org/
The National Space Society webpage

stardate.org
Learn what's going on TODAY in astronomy on the "Star Date" web page, maintained by the University of Texas' McDonald Observatory

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Maynard F. Jordan Planetarium does not guarantee that the information given on the above web sites to be accurate, accessible, or appropriate for students.