



VOYAGE: A JOURNEY THROUGH OUR SOLAR SYSTEM

GRADES K-2

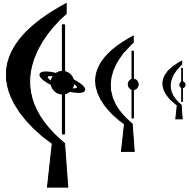
LESSON 2: A VIEW OF HOME FROM THE FRONT DOOR AND FROM SPACE

On a visit to the National Mall in Washington, DC, one can see monuments of a nation—Memorials to Lincoln, Jefferson, and WWII, the Vietnam Veterans Memorial Wall, and Washington Monument. Standing among them is *Voyage*—a one to 10-billion scale model of our Solar System—spanning 2,000 feet from the National Air and Space Museum to the Smithsonian Castle. *Voyage* provides visitors a powerful understanding of what we know about Earth’s place in space and celebrates our ability to know it. It reveals the true nature of humanity’s existence—six billion souls occupying a tiny, fragile, beautiful world in a vast space.

Voyage is an exhibition that speaks to all humanity. Replicas of *Voyage* are therefore available for permanent installation in communities worldwide (<http://voyagesolarsystem.org>.)

This lesson is one of many grade K-12 lessons developed to bring the *Voyage* experience to classrooms across the nation through the *Journey through the Universe* program. *Journey through the Universe* takes entire communities to the space frontier (<http://journeythroughtheuniverse.org>.)

Voyage and *Journey through the Universe* are programs of the National Center for Earth and Space Science Education (<http://ncesse.org>). The exhibition on the National Mall was developed by Challenger Center for Space Science Education, the Smithsonian Institution, and NASA.



LESSON 2: A VIEW OF HOME FROM THE FRONT DOOR AND FROM SPACE

LESSON AT A GLANCE

LESSON OVERVIEW

The world is full of objects large and small, near and far. Models are built as powerful tools to help study large things such as buildings, towns, countries, and even the Earth and the Moon. With models, things beyond our physical reach can be easily explored. To begin to distinguish “home” from “home planet,” students can build a model of their home and neighborhood as it appears from the front door of the house, from a tall building, from an airplane, and from outer space.

LESSON DURATION

One 45-minute class period



CORE EDUCATION STANDARDS

National Science Education Standards

Standard D2: Objects in the sky

- The sun, moon, stars, clouds, birds, and airplanes all have properties, locations, and movements that can be observed and described.

AAAS Benchmarks for Science Literacy

Benchmark 11B1:

- Many toys are like real things in some ways but not others. They may not be the same size, are missing many details, or are not able to do all of the same things.

Benchmark 11B2:

- A model of something is different from the real thing but can be used to learn something about the real thing.



RELATED EDUCATION STANDARDS

AAAS Benchmarks for Science Literacy

Benchmark 6D1:

- ▶ People use their senses to find out about their surroundings and themselves. Different senses give different information.

Benchmark 8B2:

- ▶ Several steps are usually involved in making things.

Benchmark 11B3:

- ▶ One way to describe something is to say how it is and isn't like something else.



ESSENTIAL QUESTION

- ▶ How can models help us understand our home, local neighborhood, and our world?



CONCEPTS

Students will learn the following concepts:

- ▶ Distance can change our view of an object even though the object does not change.
- ▶ Our home is on the planet Earth. In fact, our home *is* planet Earth.



OBJECTIVES

Students will be able to do the following:

- ▶ Build a model that represents the student's home, from different perspectives.
- ▶ Demonstrate an understanding that our home is located on the planet Earth.

SCIENCE OVERVIEW

Many objects on Earth can be observed from different perspectives and distances. For example, at school one can stand within arm's reach of a wall and see windows, doors, and even small scratches in the paint. If one stands on top of the tallest building in town, it is still possible to see the school building and where it is located in the neighborhood, but the details would probably not be visible. Distance has changed our view of the object, though the object has not changed at all.

By the same token, if the observation is done from higher up in the sky, such as from an airplane, the students' school would appear as only a tiny speck. It might not even be seen at all, depending on how high the airplane is flying and weather conditions. It would be possible, however, to see the whole neighborhood and maybe the whole city. Once again, distance has changed the view of the object, even though the object is still the same.

Let's take the observation into space. Imagine flying a rocket ship to the Moon and looking back at the Earth. It is no longer possible to see your city, your neighborhood, or your school. What can be seen is a blue sphere—our planet—with clouds, oceans, and continents.

This introduces the idea that Earth is part of a larger neighborhood, and that it is possible to study, and model that larger neighborhood just as the students' homes and neighborhood are studied and modeled.

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CONDUCTING THE LESSON

WARM-UP

PREPARATION & PROCEDURES

Ask students to define their 'home.' (*Desired answer: the place where I live*) Ask students if their home includes the building that they live in? (*Desired answer: yes*) Ask students if it also includes their backyard, driveway, or parking lot. Accept all answers. Ask students if their home includes their neighborhood or the school. Accept all answers. Write students' suggestions on the board for later comparison.

PRE-ASSESSMENT



STUDENT MATERIALS

- ▶ notecard
- ▶ pencil

PREPARATION & PROCEDURES

1. Have students stand at the window and look outside, making a mental picture of what they see. If you wish, you can take them outside.
2. Then tell the students to look up into the sky, again making a mental picture of what they see.
3. Back at their seats, have students list everything they could see. Keep a list of their comments (e.g., buildings, birds, planes, clouds, the Sun, etc.) on the board.
4. Ask students if they wanted to explain to someone what their schoolyard looked like, would a list of items be the best way. (*Desired answer: no, a picture would be better*) Ask students to draw a picture or model of their schoolyard on a notecard.
5. Darken the room and ask students to close their eyes. Ask students to imagine their schoolyard at night; how would it appear different? (*Desired answer: it would be dark*) Ask students if the sky would look the same. (*Desired answer: no*) Ask students how it would appear different. Listen for comments about stars, the Sun, and the Moon. See if anyone recognizes that the Moon can look a little different shape (crescent, full) depending on the day.

6. Do not move on until you have assessed that all students were able to create a physical model of their daytime schoolyard and a mental model of their nighttime schoolyard.

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ACTIVITY: A MODEL OF MY HOME

Students construct hanging models of four drawings to model the students' homes: seen from the front door, from a tall building, from an airplane, and from space.



STUDENT MATERIALS

- Four 5" x 8" notecards per student (three if the class has completed *Voyage Lesson 1: Making Models to Understand Our Home*)
- Crayons or colored pencils
- Tape
- One string, ribbon, or 1" wide sheet of paper (e.g., a sentence strip), approx. 24" long for each student

PREPARATION & PROCEDURES

1. For each student, write the following titles on separate notecards, "My home from the front door," "My home from a tall building," "My home from an airplane," and "My home from space." If the class completed *Voyage Lesson 1: Making Models to Understand Our Home*, the first title can be omitted, leaving three notecards per student.
2. Have students sit at their workstations or desks, with their drawing materials.

TEACHING TIP

If you have already completed *Voyage Lesson 1: Making Models to Understand Our Home*, use the models the students completed in Lesson 1, Activity 2 as Model 1, and have the students begin by making Model 2.

Model 1

3. Draw a general shape of a house on the blackboard that fills the entire blackboard. Draw a stick figure at the front door. (See Teacher Fact Sheet, Fig. 1)
4. Tell the students to imagine that they are standing at the front door of their house or apartment building. Ask them what they see. Suggestions: windows, door, curtains, etc.
5. Have them draw a model of what they would see on the card labeled "My home from the front door."
6. Have the students put their drawing aside.

Model 2

7. Ask the students if their house would look the same from the top of a tall building. If they can't go to a tall building and look down,

how could they show this? (Make a model) Draw a tall building on the left side of the blackboard. Draw a stick figure on top. Below it, draw a general shape of a house. (See Teacher Fact Sheet, Fig. 2)

8. Ask students if they've ever been to the top of a tall building, or a hilltop, and looked out over the city. Ask students to imagine being on top of a tall building, and ask them what objects they could see on the ground or in the air, and what they could not see.

TEACHING TIP

To understand the effect of distance on visible details, have students place several toys on the ground or in a long hallway, then walk away, counting their number of steps. Every 10 steps or so, have them look again towards the objects and describe what they see. Ask them to explain what appears to happen to the details, and eventually to the objects themselves. Determine if they understand that the objects are still there, even when no longer visible. Discuss why they can still see the larger objects, and have them speculate as to how far they would have to go to no longer see them.

9. If you can bring a dollhouse into the classroom, have the students stand on a chair above it, and from a slight distance. Tell them to imagine what their own house and neighborhood might look like. If necessary, point out that things are much smaller and that details will no longer be visible. They will probably see other houses, a park, a store, roads, people walking around, etc.

10. Have them draw a model of what they would see looking down on their own home on the card labeled "My home from a tall building."

11. Place this drawing aside.

Model 3

12. Ask the students if their house would look the same from an airplane. If they can't go in an airplane and look down, how could they show this? (Make a model) Draw a small airplane on the left side of the board, with a little face inside one window, and the ground below. Below it, draw a general shape of a house. (See Teacher Fact Sheet, Fig. 3)

13. Ask the students if they've ever been up in an airplane, and what else they could see.

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14. Point out that since they are flying very high up, they can only see larger things, and might not even be able to see people! Have the students describe some things they might see (buildings, highways, forests, and cities, mountains, etc.). They might also be looking *down* on clouds.
15. Have students draw what they would see from this airplane looking down on their home on the card labeled “My home from an airplane.”
16. Have the students put their drawing aside.

Model 4

17. Ask the students if their house would look the same from space, for example, from the Moon. If they can’t go to space and look down, how could they represent this? (Make a model) Draw a large circle on the board. (See Teacher Fact Sheet, Fig. 4).
18. Ask students if they have seen photos or movies about astronauts or space travel.

TEACHING TIP

It is important to note that students sitting on the sides of the classroom may look at a circle on the board and see an ellipse (an oval). They may not be able to draw a proper circle without assistance, so their drawings may look more oval than round unless you help them.

19. Ask if anyone knows what the circle is (the world, Earth).
20. Ask whether their house is visible from space. Students should recognize that they would not see their actual house, but that they would be able to see some very, very big things, such as oceans, and land masses like islands and continents.

21. Have the students draw a model of what they would see if they were in space on the card labeled “My home from space.” Help them draw the circle representing Earth if necessary.
22. Using the ribbon, string, or 1-inch wide strip of paper as a backing, have the students tape their models of their home from Model #1 at the bottom to Model #4 at the top. (See Teacher Fact Sheet)

TEACHING TIP

Place the students’ models of home around the room and hallways, either hanging them from the ceiling or walls, to remind them of the larger home we all share together.

REFLECTION & DISCUSSION

1. Help students begin to understand the relative location of their house on the four different models by having them look at each others' models and describe what the models have in common. Ask students what happens to their house as they move farther and farther away. *(Desired answer: the farther they move away from their house the less detail they see, until their house disappears from view)* Ask students to describe the biggest objects in each of the models they drew. They should be able to understand that as they move farther away, they can make models of bigger and bigger objects. In fact, in Model 4, they modeled the biggest thing they've ever touched: Earth.

2. Ask students if each drawing is still a model of their home, even if their house is tiny or can't even be seen. *(Desired answer: yes, because each drawing still includes my home—the place where I live, regardless of how big my house may appear)*

CURRICULUM
CONNECTIONS

- ▶ Art: Have students incorporate some aspects of reality into their images (color of bricks, shape of front door, number of floors of their building, and other elements that are important to the students.
- ▶ Geography: See if students can recognize major features on neighborhood maps.
- ▶ Technology: Have students use graphics programs on school computers to make models.

TRANSFER OF KNOWLEDGE

1. Ask students, "Have you ever looked up in the sky at night and seen anything?" *(Desired answer: Moon, stars, meteors, planets)* If available, show photos.
2. In order for students to apply what they have learned, have them draw a model of the Earth and the things in the sky. Give them a hint: imagine not stopping with Model 4 and drawing the next model.
Answer: if we imagine moving farther away from Earth, then maybe our model (our drawing) would include the Earth, the Moon, the Sun, planets, etc.).
3. Ask students, "What do you suppose we might learn by making models that include the Earth and objects in the sky?" *(Desired answer: we could learn how big Earth is compared to the other objects in the sky)*

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ASSESSMENT CRITERIA FOR THE ACTIVITY

During the *Reflection & Discussion* students should recognize that the farther they move from their house the less detail they see, and that they get to see (and therefore model) larger and larger objects. During the *Transfer of Knowledge* discussion, students recognize that regardless of how far they are from home, their drawings are still models of their home. They may also recognize that by moving even farther from the Earth, they may get to see (and therefore model) objects in the sky.

K-2 students may be evaluated as follows. They need not demonstrate all the characteristics of a category to fall within it, though strong evidence of their classification by the teacher should be provided.

4 Points

- Clearly and consistently demonstrates a sophisticated understanding of the concepts nearly 100% of the time by applying them accurately in activities, questions, comments, work, and projects both in the classroom and elsewhere.

3 Points

- Shows a nearly complete grasp of the concepts by using them appropriately at least 75% of the time in class, asking pertinent questions, and by making viable attempts at applying the concepts to other aspects of learning.

2 Points

- Responds correctly to direct questions regarding the meaning of the concepts, but cannot yet express them or demonstrate them consistently and accurately; still makes errors about 50% of the time.

1 Point

- Indicates little more than random guessing at understanding the concepts; cannot focus on essential elements or regularly respond correctly to leading questions; less than 50% accurate.

0 Points

- No work completed.

PLACING THE ACTIVITY WITHIN THE LESSON

Discuss with students how, by making models of their home from different points of view, they can understand the broad definition of "home."

LESSON WRAP-UP

LESSON CLOSURE

In this lesson, students traveled farther and farther away from home, but at each stage looked back at their home. Leaving home and looking back allows us to place the notion of home in a greater context. In this lesson closure, students return home and hopefully know it for the first time. This sentiment is embodied in the quote below from T.S. Eliot's *Four Quartets*:

"We shall not cease from exploration. And the end of our exploring will be to arrive where we started and know the place for the first time."

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INTERNET RESOURCES & REFERENCES

Student-Friendly Web Sites:

Astronomy for Kids

www.frontiernet.net/~kidpower/astronomy.html

Kids Astronomy

www.kidsastronomy.com/solar_system.htm

NASA Kids' Club

www.nasa.gov/audience/forkids/kidsclub/flash/

Teacher-Oriented Web Sites:

American Association for the Advancement of Science, Project 2061
Benchmarks

www.project2061.org/tools/benchol/bolintro.htm

Exploring Planets in the Classroom

www.spacegrant.hawaii.edu/class_acts/

NASA Quest

quest.arc.nasa.gov/sso/teachers/

National Science Education Standards

www.nap.edu/html/nses/

The Nine Planets

www.nineplanets.org

Star Date

stardate.org/resources/ssguide/

Voyage: A Journey through Our Solar System

www.voyagesolarsystem.org

Journey through the Universe

www.journeythroughtheuniverse.org

OTHER REFERENCES

Fowler, Allan. *When You Look up at the Moon*

Getz, David. *Floating Home*

Graham & Wharfe. *Space Travel*

Rabe, Tish. *There's No Place Like Space!* A Dr. Seuss Book

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*Internet Resources
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Teacher Fact Sheet

TEACHER FACT SHEET

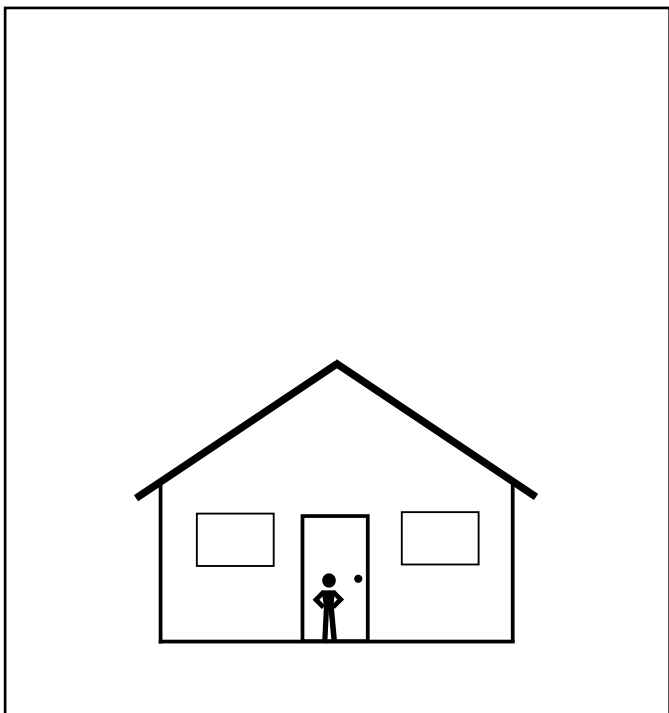


Figure 1

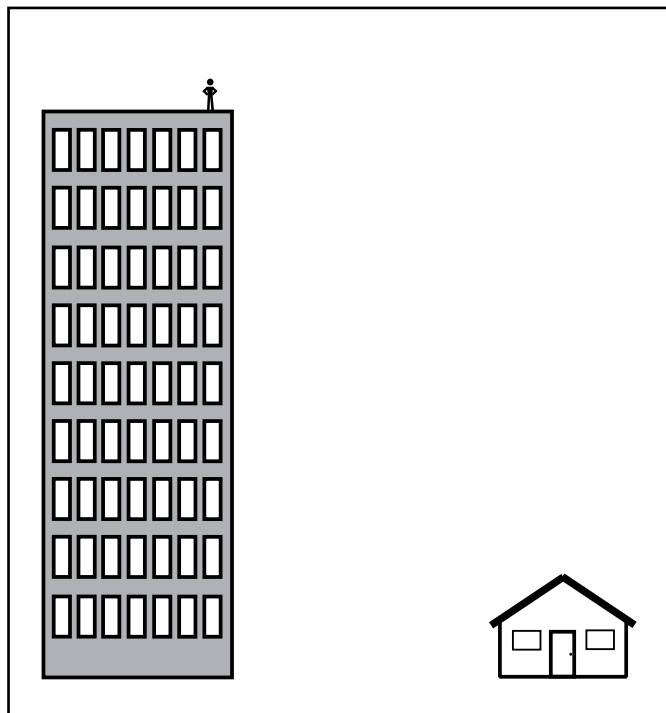


Figure 2

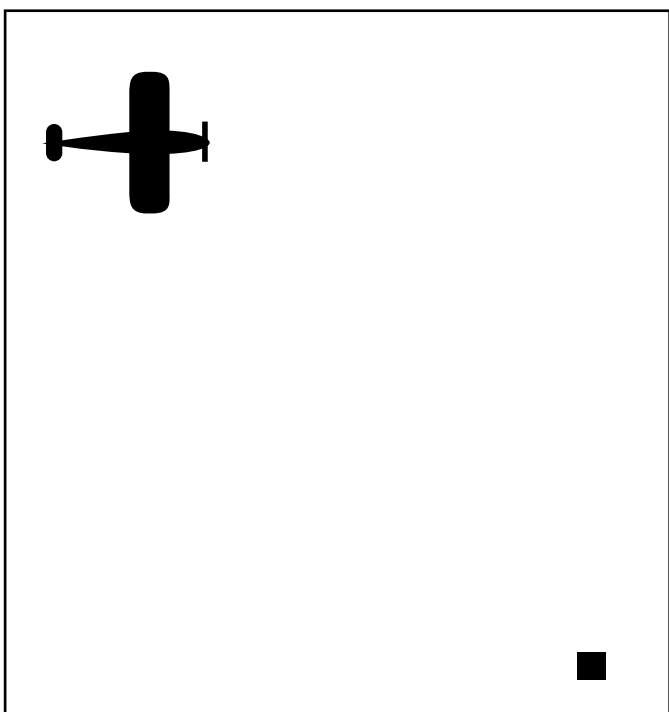


Figure 3

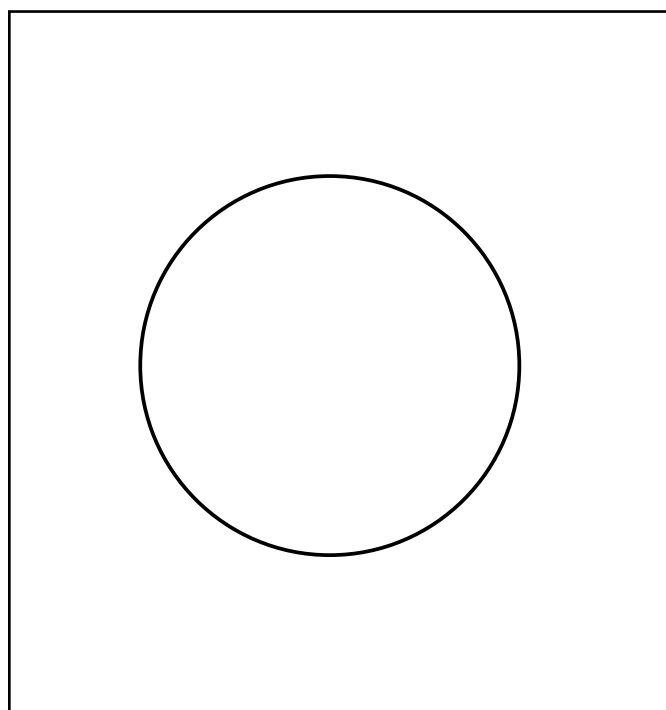
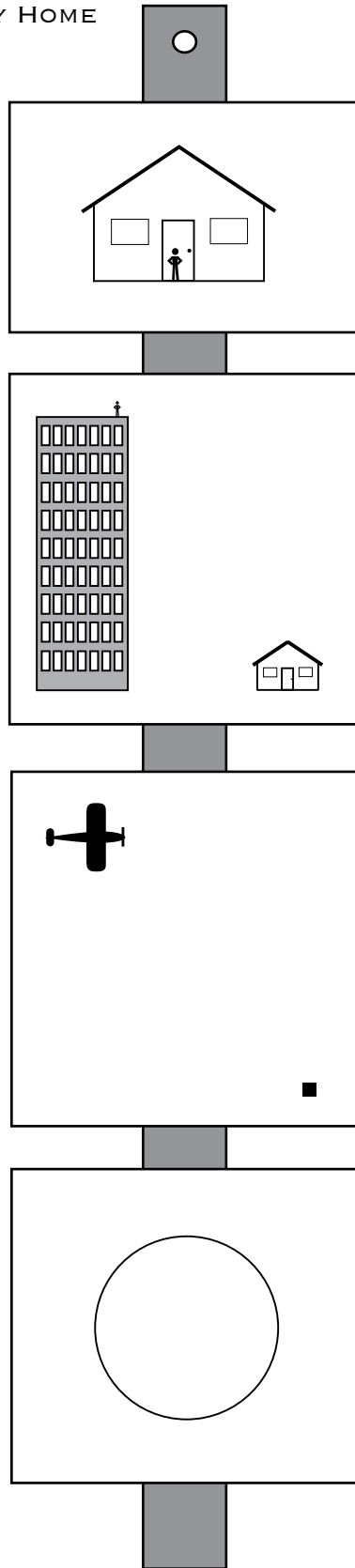


Figure 4

SAMPLE MODEL OF MY HOME



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