

INTEGRATED UNIT STUDY

(Earth/Space Science / 4th – 6th grade levels)

Author's note: This is an example of an Integrated Unit Study about Space Travel and Our Moon. It will fulfill a state's education requirement for many areas: Earth and Space Science, Physical Science, Life Science, Math, English, Writing, Music, Art, Social Studies, and more.

Indeed, one of the strongest benefits of an Integrated Unit Study is that you are covering several, if not all, subject areas as you learn about a topic. Another great benefit, perhaps the best, is that students are more naturally motivated because they are able to learn the way we learn best.

The best learning is rarely sequential, the way most textbooks present material. Textbooks are not very brain friendly because our brains tend create structure using divergent thinking.

In learning a new hobby or skill, we will gather materials, read a bit, maybe talk with someone, and then we try doing a bit of whatever it is. With that trial effort, we evaluate how we did, what we could do better, what we need to learn to take things to the next level, and think about how we are going to get that knowledge. So it should be with a unit study. Let's get started.

Choose a Title for the Unit:

"To the Moon and Back"

How much time for the Unit?

4 to 6 weeks

What are the Objectives of the study?

Author's note: It's a good idea to have Bloom's Taxonomy beside you as you develop objectives. You'll want your student to work at all levels. I've also included questions that prompted .

- ❖ Develop an understanding of and appreciation for the environment of space. (What's a vacuum?)
- ❖ Be able to demonstrate gravity and its effects. (What is escape velocity?)
- ❖ Be able to tell others about the purpose of the moon. (Okay. Tides. But why do we need the tides? What else?)
- ❖ Describe the obstacles to space travel and how humans met the challenge. (Can we build a rocket?)
- ❖ Explain why the moon changes and from where its light comes.
- ❖ Be able to list three books about the moon. Read one.
- ❖ Where did the moon come from?

Author's note: You can develop more. But now it's time to look at how to implement the Unit. Once you've decided on a topic, begin to gather materials. You'll want to include your student on the hunt a little later, but you will need the core materials for the different subject areas firmly in mind, if not in hand, before you begin.

Materials:

Destination: Moon; The Spritual and Scientific Voyage of the Eighth Man to Walk on the Moon, by Astronaut James Irwin. — This will be my main text.

Flight of the Falcon, by Paul Thomsen — This is the biographical story of Jim Irwin and will be the “literature” read for the unit.

Our Created Moon by Don DeYoung and John Whitcomb — A great book that is set up in a question/answer format. This will be for the instructor (me!) to help me answer questions or think of new questions to ask as we study together.

The Astronomy Book by Dr. Jonathan Henry — The first 40 pages are especially relevant to our unit of study. The big picture overview of this book might help to put the earth and the moon in context for the unit.

The Bible — Use this to look up verses that relate to your studies.

A Telescope —We might want to buy or borrow one to look at the moon, although we could use binoculars. Is there a local astronomy group we could meet with?

Posters—A poster of the night sky. A poster of the moon.

A Journal—to record your observations and reflections on what you’ve learned.

Author’s note: This should be an open and flexible list. You will discover the need of more materials. Add them to your list as you go.

Begin Planning for the Field Trip to the nearest I-Max, the planetarium, or another place of your choosing.

Author’s note: An evening with the local astronomy group might work here. One field trip, taken in the first third of the unit of study, should help your student to put things in perspective. It can be the framework for understanding.

Prime the Pump

Author’s note: One week before you start the unit of study, put up the posters — at waist level — without commentary. This should help the student better assimilate new learning and will hopefully promote better questions for the next step in the unit.

Bible: Look for verses that support your study. You will find verses listed in most of the recommended books.

Subject Matter Connections: In integrated studies you find that all things are connected. You might think that coal would not be a part of the study. You would likely be correct, but it could be. Looking at rockets, blasting into space (propulsion) can take us to look at fuel, fuel can have us looking at kinds of fuel, and coal is a part of the equation, whether you approach it through history, or fossil fuel related derivatives. Thus, what you cover and the depth of the learning is often a matter of choices you make.

Author's note: This week before you start the unit of study, you will need to finalize some of the curriculum you wish to cover in the subject areas. But please keep the door open as you go through the unit. Sometimes the best learning takes place in teachable moments and/or from a question that your student asks. Good teaching means good listening and responding to student input.

The first day: Take time to create the K-W-H-L chart and fill it in with your student. (The “L” will be the next to last thing you do in the unit.)

Science: Below are a few of the 5th grade standards for Science met by this unit of study.

State SLE State SLE Description:

Grade 5 Science Curriculum Document

Strand # 1

NS.1.5.1 Make accurate observations

NS.1.5.2 Identify and define components of experimental design used to produce empirical evidence: hypothesis, replication, sample size, appropriate use of control, use of standardized variables

NS.1.5.4 Interpret scientific data using: data tables/charts, bar graphs, circle graphs, line graphs, stem and leaf plots, Venn diagrams

NS.1.5.5 Communicate results and conclusions from scientific inquiry

NS.1.5.7 Summarize characteristics of science

NS.1.5.8 Explain the role of observation in the development of a theory

NS.1.5.9 Define and give examples of hypotheses

Strand # 2

LS.4.5.05 Examine the role of limiting factors on the carrying capacity of an ecosystem: food, space, water, shelter

LS.4.5.08 Describe and diagram the carbon dioxide-oxygen cycle in ecosystems (Author's note: Think in terms of how to have breathable air in the vacuum of space.)

Strand # 3

PS.5.5.01 Identify the relationship of atoms to all matter

PS.5.5.02 Conduct scientific investigations on physical properties of objects

Author's note: This study will meet the standards related to about 20 of the 50 or so state standards of fifth grade science curriculum for Arkansas. The same will be true for your state. This number will vary depending on how you approach the topic and the direction your course of study takes as it follows natural paths of inquiry.

This is true for each of the subject areas. One integrated study can meet many requirements for many subject areas.

- ❖ We will study mass and gravity (the moon and tides)
- ❖ We can construct a model of the earth (basketball), the moon (tennis ball) and use a flashlight in a darkened room to show how the moon waxes and wanes, and the way eclipses happen.
- ❖ We will explore vacuums.
- ❖ We will explore methods of propulsion
- ❖ We will build a model rocket.

Math:

- ❖ Weigh the student. Calculate what one-sixth of the weight would be.
- ❖ Using ratios, demonstrate the above (1 to 1/6) by finding weights the student can hold that represent her weight on earth in one hand and her weight on the moon in the other.
- ❖ Figure how much weight and volume are saved by taking freeze — dried food into space.
- ❖ If we shoot a rocket into the air, what is the formula that tells us how high it went? (You can practice by using the same technique to find out how tall a tree or house is.)
- ❖ How fast did it go? What is the formula for figuring the speed of something? (I think it has something to do with time and distance...)

Reading/Literature:

Destination Moon is 45 pages long. If this is a four week unit of study, that would be equal to about 11 pages of reading per week.

Flight of the Falcon is 80 pages long, or 20 pages per week.

Author's note: If this is a four-week unit, figure 20 days of instruction. With only 31 pages of reading per week, that's just over 6 pages of reading per day. You may wish to take turns reading aloud. It's helpful to pause to ask questions for clarification and understanding. You may also want to assign a book report as a part of the study.

Writing:

The student should spend a minimum of five (5) minutes per day journaling what it is they have observed/learned. English composition, grammar, etc. can all be taught through writing assignments. Spelling could also be addressed by using words encountered in your studies.

Social Studies:

- ❖ Explore the use of the moon for navigation.
- ❖ What is the moon called in other cultures? (We see a "Man in the Moon," what about other cultures?)
- ❖ What myths involve the moon as a part of the story?
- ❖ Who invented the telescope? When?

Music:

- ❖ Research for music inspired by the moon.
- ❖ Write and perform a song/rap about the moon.

Art:

- ❖ Find art that represents the moon.
- ❖ Have the student draw his or her own version of the moon.
- ❖ This unit takes at least four weeks of study. Observe the moon each night and draw it in your journal.

Hands-on Activities:

- ❖ From the "Science" section, making a model of the relationship between the sun, earth and moon.
- ❖ Building a model rocket and firing it. (Adult supervision)
- ❖ Using different size rocks (weigh them) and a tub of mud at a slightly thicker than cake batter consistency, explore the impact (crater-ability) of each. Do your craters look like those on the moon?

"Show You Know" Presentation: As a culminating activity, the student will use a tri-fold or a computer PowerPoint to present what they have learned during this unit.

Next to Last: Fill out the "L" part of your KWHL chart you posted on the wall at the beginning of the unit.

Last: Reflect and evaluate how you might have made the unit better, what worked what didn't. What would you like to study to take you beyond the unit?

Author's note: The unit presented here is incomplete and meant as an example. Feel free to use it as a starting point for creating a more in-depth unit. As is, this unit can be a part of your regular studies by allotting one to two hours per day, thus allowing you to continue the sequential curriculums you may already be using. Or you may want to use the unit as a stand—alone piece.

Jerry Runnersmith 8/23/07

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