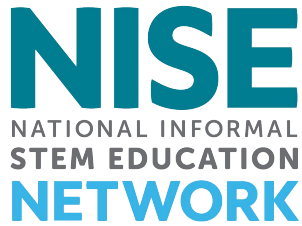


Earth & Space Project-Based Professional Learning Community



Earth & Space Learning & Content Frameworks Overview

Recorded in January 2022 as part of the Earth & Space Project-Based Professional Learning Community



Earth & Space Learning and Content Frameworks

Earth & Space Learning Framework

The Earth & Space Learning Framework describes the intended actions of learners engaged with NISE Network hands-on activities and exhibition components based on the research, discoveries, and missions from NASA's Science Mission Directorate. The three principles of the Learning Framework—phenomena, process, and participation—support **six interrelated strands of learning** documented by the

National Research Council. To further illustrate each principle and its supporting statements, the following pages show example connections to the Explore Science: Earth & Space toolkits and the Sun, Earth, Universe exhibition. The Learning Framework is a companion to the Earth & Space Content Framework, which describes six ideas that represent a basic understanding of Earth and space science.



PRINCIPLES

Experience Earth and space phenomena and explore science findings

Experiencing the joy of active learning, including play, discovery, invention, and experimentation
Experiencing real phenomena, celestial events, and compelling imagery
Exploring our place in the universe
Investigating the big questions that drive Earth and space research



Exploring the Universe: Filtered Light

Use the scientific process and reflect on science as a way of knowing

Using an iterative design process similar to engineering and scientific research
Using a variety of tools and approaches to make discoveries
Experiencing the power and limitations of data sets
Making and using models to communicate and further our understanding
Using our imagination and ingenuity to explore the universe



Exploring the Universe: Star Formation

Participate in the scientific community and identify as a science learner

Working together in groups to accomplish goals and tackle challenges
Exploring the relevance of Earth and space science
Considering the social dimensions of Earth and space science
Identifying as someone who learns about and sometimes participates in current research



Exploring the Universe: Asteroid Mining

STRANDS OF LEARNING

Developing interest in science: Experience excitement, interest, and motivation to learn about science

Understanding science knowledge: Generate, understand, and use explanations, arguments, models, and facts related to science

Engaging in scientific reasoning: Manipulate, predict, question, observe, and make sense of the natural and physical world

Reflecting on science: Reflect on science as a way of knowing and as a personal process of learning about phenomena

Engaging in scientific practice: Participate in scientific activities and learning practices with others using scientific language and tools

Identifying with the scientific enterprise: Develop an identity as someone who knows about, uses, and sometimes contributes to science

Developed by the NISE Network. Published in 2021.
National Research Council of the National Academies of Sciences, Engineering, and Medicine. 2021. *Earth & Space Learning Framework*. Washington, DC: National Academies Press.



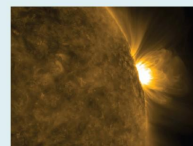
Published under a Creative Commons Attribution-NonCommercial-ShareAlike license.
<https://creativecommons.org/licenses/by-nc-sa/4.0/>

This material is based upon work supported by NASA under cooperative agreement award numbers NNX16AC01A and NNX16AC01B. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Aeronautics and Space Administration (NASA).

Earth & Space Content Framework

The Earth & Space Content Framework presents six key science content ideas for informal educators engaging the public with research, discoveries, and missions from NASA's Science Mission Directorate. These six ideas represent a basic understanding of Earth and space science. To further illustrate each main idea, the following pages show

suggested content connections using NISE Network examples from the Explore Science: Earth & Space toolkits and the Sun, Earth, Universe exhibition. The Content Framework is a companion to the Earth & Space Learning Framework, which describes the kinds of learning experiences valued by the network when using Earth and space science content.



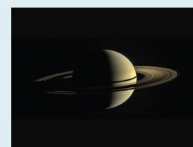
The Sun powers Earth and our solar system.

Our nearest star emits a massive amount of energy across the electromagnetic spectrum and through a stream of charged particles.



Earth is a dynamic planet.

Interactions between air, water, rock, and life, including human activities, change our planet and its climate.



Planets and moons beyond our home world may contain water and life.

Exploring the variety of planets, moons, and smaller objects in and outside our solar system helps us to better understand life on Earth.



The universe is very large, old, and mysterious.

Billions of galaxies, including countless stars, planets, and nebulae, fill a vast and expanding universe.



Our society chooses to explore Earth and space.

Our values influence how we ask questions, develop specialized tools and technology, and work together when exploring Earth and space.



Forces and energy connect everything in the universe.

Gravity, magnetism, and the energy transmitted by light shape all parts of the universe and help us learn more about Earth and space.

Developed by the NISE Network. Published in 2021.



Published under a Creative Commons Attribution-NonCommercial-ShareAlike license.
<https://creativecommons.org/licenses/by-nc-sa/4.0/>

This material is based upon work supported by NASA under cooperative agreement award numbers NNX16AC01A and NNX16AC01B. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Aeronautics and Space Administration (NASA).

Posted at: <https://www.nisenet.org/earth-space-frameworks>

It is all about framing...



For those of you creating new events, kits for community partners, or other experiences, can materials be grouped by:

Content messages or themes

Learning goals

Engagement styles

Popular subjects

Local interest



What framing strategy do you want to use?

It is all about framing...

Change

Understanding that the universe is always changing: galaxies are colliding, stars are forming and dying, and Earth and the solar system are hurtling through space.

In Exploring the Universe: Nebula Spin Art, learners spin paint to simulate a dying star's transformation into a nebula.



Exploring the Universe: Nebula Spin Art



Ice orbs



Rising sea



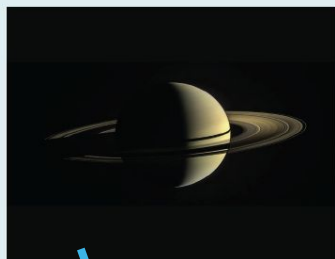
Paper mountains



Craters

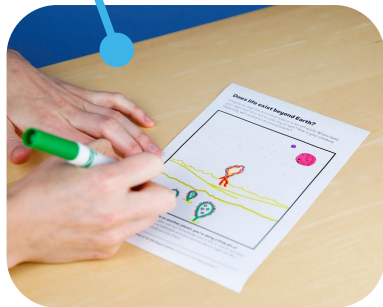
It is all about framing...

Life



Planets and moons beyond our home world may contain water and life.

Exploring the variety of planets, moons, and smaller objects in and outside our solar system helps us to better understand life on Earth.



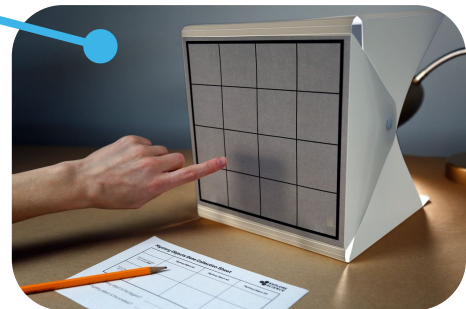
Imagining life



Nebula spin art



Pack a space telescope



Exoplanet transits

What's in that box?



	PRINCIPLES			TOOLKIT YEAR				CONTENT AREA					
	PHENOMENA	PROCESS	PARTICIPATE	2017	2018	2019	2020	SUN	EARTH	PLANETS	UNIVERSE	SOCIETY	FORCES + ENERGY
EXPLORING EARTH													
Exploring Earth: Bear's Shadow*	x			x			x	x	x				
Exploring Earth: Investigating Clouds	x	x	x	x			x		x			x	
Exploring Earth: Land Cover	x	x	x			x			x			x	x
Exploring Earth: Paper Mountains	x	x	x		x				x			x	x
Exploring Earth: Rising Sea		x	x	x		x			x			x	
Exploring Earth: Temperature Mapping	x	x				x		x	x			x	x
EXPLORING SCIENCE PRACTICES													
Exploring Science Practices: Early Explorations*	x	x					x		x				
Exploring Science Practices: Measure Up*	x	x					x		x				
EXPLORING THE SOLAR SYSTEM													
Exploring the Solar System: Asteroid Mining	x	x	x				x			x		x	
Exploring the Solar System: Big Sun, Small Moon	x	x		x				x	x				
Exploring the Solar System: Craters	x				x		x		x	x			x
Exploring the Solar System: Design, Build, Test		x	x				x					x	x
Exploring the Solar System: Hide and Seek Moon*	x	x	x		x	x			x			x	
Exploring the Solar System: Magnetic Fields	x	x			x			x	x	x			x
Exploring the Solar System: Mars Rovers		x	x		x					x		x	
Exploring the Solar System: Mission to Space New Game		x	x				x	x	x	x	x	x	
Exploring the Solar System: Moonquakes	x	x					x		x	x			x
Exploring the Solar System: Observe the Moon	x	x	x				x	x	x				
Exploring the Solar System: Observe the Sun	x	x	x			x		x	x				x
Exploring the Solar System: Pocket Solar System		x		x		x				x		x	
Exploring the Solar System: Solar Eclipse	x	x		x				x	x				
Exploring the Solar System: Stomp Rockets		x	x		x	x						x	x
Exploring the Solar System: Story Blocks*		x	x				x					x	
EXPLORING THE UNIVERSE													
Exploring the Universe: Exoplanet Transits	x	x			x					x	x	x	x
Exploring the Universe: Expanding Universe	x	x				x					x		x
Exploring the Universe: Filtered Light	x	x			x	x					x		x
Exploring the Universe: Ice Orbs	x	x		x						x			
Exploring the Universe: Imagining Life		x	x	x					x	x		x	
Exploring the Universe: Nebula Spin Art	x	x					x				x		x
Exploring the Universe: Objects in Motion	x	x			x				x	x	x		x
Exploring the Universe: Orbiting Objects	x	x		x			x	x		x	x		x
Exploring the Universe: Pack a Space Telescope		x			x						x	x	x
Exploring the Universe: Space Guess Quest Game		x				x	x			x	x		
Exploring the Universe: Star Formation	x	x					x				x		x
Exploring the Universe: Static Electricity	x	x				x			x	x			x
<i>Sun, Earth, Universe Exhibition</i>	x	x	x					x	x	x	x	x	x

* These activities were specially designed for young learners.

Thank You

