Challenger Center® and NASA eClips™

Make the Most of Destination Moon

PRE-MISSION ASTRONAUT TRAINING (~30 MIN)

Prepare your class of Astronauts for a richer virtual mission experience by helping them learn more about mapping, tracking and structure, and engines ***before*** the mission.

Mapping

Tracking and Structure

Engines

Divide the group into teams of three. Each person in the group will watch a different NASA eClips™ video or listen to the Innovation Now podcast to become an expert on one of the three topics.

	Mapping Experts *Real World: Lunar Reconnaissance Orbiter Resources*	***Tracking and Structure*** *Innovation Now: Weather or Not to Launch*	***Engine Experts*** *Launchpad: Apollo 11 - Challenges of Landing on the Moon*
Essential questions guide experts as they watch their video.	• Why is returning to the Moon important? What kinds of questions can we answer through establishing a "sustainable presence" there? • How have we built our understanding of the Moon? • What kinds of tests must scientists and engineers conduct to know a spacecraft is ready for launch?	• Why is it important to conduct weather checks prior to launch? • What conditions could affect a launch and must be considered?	• What criteria should be considered for determining a landing site? • Why would landing in a crater have presented problems for the Apollo astronauts?
AFTER viewing the video, experts report findings to their team.	• How has the Lunar Reconnaissance Orbiter been able to map the Moon? • Why was an orbiter the right spacecraft for the mapping job?	• What is a "Go / No Go" Poll? • What are some "do not launch" criteria that might scrub a launch?	• How did the Apollo astronauts help make a return to the Moon possible?

THE MISSION: DESTINATION MOON (~60 MIN)

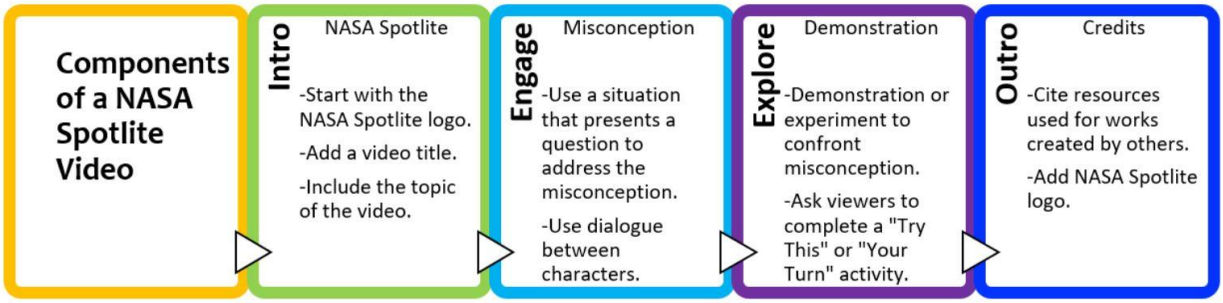
A team of researchers is ready to return to the Moon to explore its surface and establish a second habitat for astronauts to live and work! To get there, they'll launch and fly Blue Origin's reusable launch vehicle, New Glenn, and explore the Moon's surface using Blue Origin's lunar lander, Blue Moon. Student teams in Mission Control have a critical job: initiate the launch of New Glenn into orbit to land Blue Moon safely on the lunar surface. While in orbit, teams monitor for potentially dangerous space weather and space debris, conduct safety checks on the spacecraft systems, deploy and monitor satellites, and launch payloads.

POST-MISSION CHALLENGE (~3-4 CLASS PERIODS)

Students complete activities and demonstrate their knowledge by producing a NASA Spotlite animated video that will help others change what they think about one of two Moon misconceptions.

Working in teams, students:

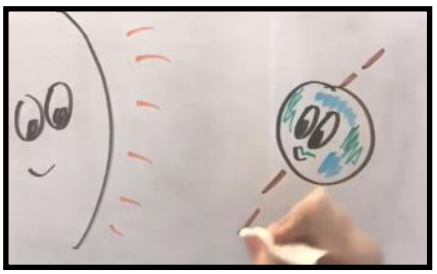
- Identify criteria for the animated video.



- Select one of the two misconceptions.

Misconception 1: Because the Moon can be seen, it is easy to launch a rocket there.	**Misconception 2: The Moon can only be seen at night.**
Demonstration and Experimenting Ideas • NASA Space Place - Launch a Rocket from a Spinning Planet (experiment) Visit Resource: https://spaceplace.nasa.gov/launch-windows/en/ • NASA – Eyes on the Solar System (simulation) Visit Resource: https://eyes.nasa.gov/eyes-on-the-solar-system.html	Demonstration and Experimenting Ideas • NASA JPL – Make a Moon Phases Calendar and Calculator (activity) Visit Resource: https://www.jpl.nasa.gov/edu/teach/activity/make-a-moon-phases-calendar-and-calculator/ • NASA – Look at the Moon Journaling Project (activity) Visit Resource:https://www.jpl.nasa.gov/edu/learn/project/look-at-the-moon/ • Night Sky (or similar) free Astronomy app

- Increase their knowledge by completing activities.
- Develop an interesting storyline.
- Write a script for the animated video.
- Film. Edit. Produce.
- Submit to NASA eClips™ for review.



Exemplary animated videos will be added to the NASA eClips website under Student Productions.

Misconception – The distance between Earth and the Moon cause seasons.

ANSWER KEY FOR PRE-MISSION ASTRONAUT TRAINING

	Mapping Experts *Real World: Lunar Reconnaissance Orbiter Resources*	***Tracking & Structure Experts*** *Innovation Now: Weather or Not to Launch*	***Engine Experts*** *Launchpad: Apollo 11 - Challenges of Landing on the Moon*
Essential questions guide experts <u>as they watch their</u> video.	**Why is returning to the Moon important?** It will help us to learn what will be needed to develop a "sustainable presence." **What kinds of questions can we answer through establishing a "sustainable presence" there?** Determine safe landing sites, location of resources, and learn how Moon has changed over 4.5 billion years. **How have we built our understanding of the Moon?** Manned missions and data collected through unmanned spacecraft such as satellites. **What kinds of tests must scientists and engineers conduct to know a spacecraft is ready for launch?** Must be sure that spacecraft can survive leaving Earth's atmosphere and that it can withstand extremes in temperatures and radiation.	**Why is it important to conduct weather checks prior to launch?** To ensure that there are no meteorological conditions that would make launching a spacecraft unsafe. **What conditions could affect a launch and must be considered?** Storms and high winds.	**What criteria should be considered for determining a landing site?** Level surface without boulders/debris or surrounding features that would block exploration and communication. Close proximity to needed resources. **Why would landing in a crater have presented problems for the Apollo astronauts?** Would have limited Apollo astronauts' ability to explore. Would have interfered with communication. Might have made take-off more difficult/impossible.
<u>AFTER</u> viewing the video, experts report findings to their team.	**How has the Lunar Reconnaissance Orbiter been able to map the Moon?** It is in a polar orbit that scans the surface of the Moon as the Moon rotates creating a detailed map. **Why was an orbiter the right spacecraft for the mapping job?** Prior to landing a rover or other spacecraft on the Moon, we needed to determine safe areas for landing and the location of resources, such as the potential for water ice.	**What is a "Go / No Go" Poll?** It is the review of criteria needed to determine if a launch can be conducted safely. **What are some "do not launch" criteria that might scrub a launch?** Weather disturbances on the spacecraft ascent track, winds greater than 30 mph on the launch pad, the presence of clouds and lightning.	**How did the Apollo astronauts help make a return to the Moon possible?** They collected rock/soil samples for study on Earth. They conducted experiments such as soil mechanics study to learn more about the properties and formation of lunar soil. They deployed experiments left on the Moon to determine the exact distance from Earth to the Moon and the effects of radiation.