

Solar System Exploration Project

Purpose: To demonstrate the connection between scientific knowledge, human curiosity, and engineering design in terms of the last 50 years of exploration of the Solar System.

Product:

1. Model- Accurate model of at least one space craft
2. Display- Informative display of the exploration of the solar system
3. Presentation- 5 minute presentation

Materials: iPad, partner, parent, Solar Walk app, NASA app, other apps or websites as appropriate (including, but not limited to, suggestions in this activity)

Procedure:

1. **Focus-** Choose a solar object to study. Each solar object needs to have a team working on it, thus you might be asked to consider your second choice.
 - ☼ Sun
 - ☼ Mercury
 - ☼ Venus
 - ☼ Earth/Moon
 - ☼ Mars
 - ☼ Asteroid belt (Ceres)
 - ☼ Jupiter
 - ☼ Saturn
 - ☼ Uranus
 - ☼ Neptune
 - ☼ Pluto
2. **Partner-** Find a partner who is interested in the same solar object as you. Write their name, phone number, and email information here:
 - ❖ Partner: _____
 - ❖ Phone #: _____
 - ❖ Email: _____@_____
3. **Research-** Use your resources to research about the missions that were used by scientists to learn about your solar body. Use the worksheet on the following page to guide your research. These questions are NOT the entire body of knowledge you will need. However, they are a good starting point. You should feel free to investigate further, asking and answering your own questions.
 - a. Keep a Bibliography of all the resources that you use in your research. Bibme.org is a fantastic place to keep a list of all your websites, books, etc. that you use.
4. **Model-** Choose one of the missions that explored your solar body for which you would like to build a model. You can choose from a fly-by, lander, or something else as long as it provided significant data about your solar body. Sometimes a mission or spacecraft studied multiple solar bodies. Your teacher will help you to make sure that there is no overlap of the various mission models. You may create more than one model. Your teacher may have access to some models already in case you can't find one online to download and print. (<https://1drv.ms/f/s!AhSxtNIJcIAGg3Mj8v6txWRwY4dh>)
5. **Display-** Build a creative and interesting tri-fold display of your research. You should include the following components:
 - ✓ Basic facts
 - ✓ Timeline of discovery and exploration
 - ✓ Driving questions
 - ✓ Colonization
 - ✓ Major moons
 - ✓ Future plans of study/exploration
6. **Presentation-** Prepare to talk for 5 minutes to the class with your display and model.

Research Questions

Use the following questions to initiate your research into your solar object. There may be some information that is not relevant to your solar body (there are no landers to Pluto). Or you may need more space for your own questions. These questions are ONLY a starting point for you. It is up to you to find the spark and delve deeply into the research and find something that connects you to the project to make it personal and exciting.

Answer the questions in your notebook. This will be collected as part of your grade.

BASICS- *Talk about the basic facts about your solar object.*

1. What is the name of your solar object? When was it first discovered? Why is it named that?
2. How big is your solar object?
3. How far from the Sun is your solar object? From Earth?
4. How long would it take to travel there?
5. What temperature is it?
6. How long does it take to orbit the sun?
7. How long is one day?
8. What is the atmosphere like?
9. What is the surface like?
10. What is the gravity of your solar object?
11. How many moons does it have? What are their names?
 - a. Answer the same questions about the moons as you did about your solar object.
12. List other questions you have about your solar object and answer them.

EXPLORATION- *List and describe the missions to space that explored your solar object.*

13. How many space craft have explored your solar object (include moons as appropriate)? This could be a fly-by, an orbiter, a lander, or maybe even something else.
14. Name the most important missions to your solar object.
15. When were these missions?
16. How did one mission lay a foundation for the subsequent ones?
17. What were the scientists hoping to discover? What questions were they asking that drove them to excel? What were the answers to the questions the scientists asked? Be as specific as possible.
18. What challenges did the scientists/engineers face in creating the mission? Consider the launch, the arrival, the collection of data, and returning the data to earth. Be as specific as possible.
19. What are the future plans of any agency worldwide to continue exploration of that solar body or its moons?
20. What other questions do you have about space exploration as related to your solar body?

LIVING THERE- *Spend some time describing what it would be like to live on this solar body. Imagine that you were in charge of setting up a colony or space station on this solar object.*

1. Does this object have water? How do you get/keep water? What might be a plan for food and nutrition?
2. Can you breathe the atmosphere? Is there any oxygen at all?
3. How would you stay warm? Get cool?
4. What is the surface like? Can you build on it? Live in caves? Use hover-pods?
5. What could you do for entertainment and exercise?
6. What else do you need to consider in establishing a livable situation/colony?

Resource Links

Here are some links to online resources that might be useful in your quest for greater knowledge and understanding. This list is not comprehensive. You will need to use additional resources to completely succeed at this project.

- ⚙ NASA Solar System Exploration by Target:
 <http://solarsystem.nasa.gov/missions/index.cfm>

- ⚙ NASA Solar System Exploration home page:
 <http://solarsystem.nasa.gov/index.cfm>

- ⚙ NASA Explorer's Guide to the Solar System:
 http://solarsystem.nasa.gov/multimedia/download-detail.cfm?DL_ID=682

- ⚙ NASA Year of the Solar System home page:
 <http://solarsystem.nasa.gov/yss/index.cfm>

- ⚙ USGS Planet and Satellite Names and Discoverers:
 <http://planetarynames.wr.usgs.gov/Page/Planets>

- ⚙ Build your own Space Fleet:
 <http://solarsystem.nasa.gov/kids/index.cfm?Filename=papermodels>

- ⚙ Universe Spacecraft Paper Models:
 <http://science.nasa.gov/kids/the-universe/universe-spacecraft-paper-models/>

- ⚙ Solar System Alien Project:
 http://mail.colonial.net/~hkaiter/Solar_System_Alien_Project_Information.html

Grading Rubric

Component	0 Missing	1 Needs Improvement	2 Below expectations	3 Meets expectations	4 Exceeds expectations	Score
Display						32 pts possible
Research notes	Missing	Minimal scratch work on worksheet	Most questions answered in notebook	All questions answered, plus extra questions clearly included	Questions neatly answered in complete sentences with student created questions included	
Bibliography	Missing	3-5 entries	5-10 entries	10-15 entries	15-20+ entries	
Basic Facts	Missing	Hard to discern	Useful display, but some information is missing	Very useful information	Impressive amount of information	
Timeline	Missing	2-3 major events described	3-5 major events described	5-8 major events described and future events considered	8-10 major events described, future events listed, and significance of each creates a thematic story of discovery	
Driving Questions	Missing	Display may have a question that may have been asked by a scientist	Display mentions that scientists ask questions to do work	Each mission or discovery is preceded with a question that focused the scientists and engineers	The questions of scientists and engineers is clearly the driving force of discovery in the solar system	
Colonizing	Missing	1-2 colonization components are mentioned or described	3-4 colonization components are described	5 out of the 6 specific components of colonization are considered in detail, including connections between them	All 6 colonization components are listed in detail with specific connections between them	
Future Exploration	Missing	The future missions are not considered adequately	Future missions are mentioned	Future missions are described in detail with driving questions and expected outcomes	Future missions are described including specific background information driving the questions of the mission	
Failures/ Solutions	Missing	Some mention of problems in mission design	Details of some mission problems are given	Exploration missions include discussion of some problems and solutions faced by the engineers	Failures are celebrated as opportunities for success	

Grading Rubric

Component	0 Missing	1 Needs Improvement	2 Below expectations	3 Meets expectations	4 Exceeds expectations	Score
Presentation						32 pts possible
Time	Missing	>1 minute	2-3 minutes	<5 minutes	5 minutes exactly	
Volume	Missing	Barely audible or blasting the audience	Mostly audible at appropriate volume	Clearly audible for the whole presentation	Clearly audible with appropriate intonation and fluctuation	
Clarity	Missing	Some words were understandable	Most words were clearly spoken	Clear enunciation, even of difficult words	Presentation flows smoothly with no hiccups of enunciation or pronunciation	
Organization	Missing	Information was presented	Information may have sections	Clear segmentation of information according to an identifiable chronology or order	Presentation flows like a story with transitions, introductions, and conclusions	
Completeness	Missing	Some information presented	Information helps audience understand mission and discoveries, may have gaps	Use of summative thoughts allows for greater density of information in timeframe given	Audience can comfortably talk about this solar body and the associated missions	
Confidence	Missing	Presenter is unsure of information	Presenter is unclear about sources of information	Presenter can support presentation from resources	Presenter directs audience to specific sources to attain additional information on missions and solar body	
Display	Not mentioned or used	Student mention that they have a display	Display shows some of the information mentioned, but not necessarily tied in	Display enhances presentation with clear information and useful images for further	Students use display in a creative manner, guiding audience to observe the display on their own	
Model	Model is not used in presentation	Model is shown as part of presentation	Model is mentioned as a tool for discovery	Model is used to demonstrate the scientific discoveries and engineering successes of exploration	Two models used to explain the driving questions for exploration of the solar body as the prime thrust of the presentation	

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Artistic Value						16 pts possible
Creativity	Information is displayed without any accents or images	Typical arrangement of elements. Limited visual accents and images.	Some interesting visual elements and accents are used.	Visual elements and component arrangement demonstrate innovative ideas. Visual images and accents add interest.	Display is very engaging and innovative. Extra details add interest.	
Composition	No color used. No visual accents.	Not enough contrast. Too many or too few colors used. Lacking unity. Haphazard or distracting arrangement of visual elements.	Color scheme is weak. Arrangement is not well balanced.	Strong contrast, color scheme and effective arrangement of important elements. Repeated shapes and designs create visual accents.	Extremely strong contrast, color scheme, and very effective use of visual elements. Arrangement of important elements and visual accents create a very strong composition.	
Craftsmanship	Very messy. Mistakes interfere with viewer's ability to see things clearly or read text.	A bit messy. Mistakes detract from the appearance.	Mostly neat construction. Some cutting and gluing problems, or lettering crooked. Loose edges.	Neat construction: cutting, gluing, lettering. Elements are glued securely (no loose edges).	Very polished appearance. Very well constructed.	
Communicates	No images are used. Text is not readable.	Very few images. Titles and text are too small, and difficult to read.	Images are too small or not clear. Text doesn't stand out very well. Text boxes are too wordy.	Images are clear and enhance the viewer's understanding. Text is readable and easily understood.	Images are strong and clearly communicate. Text stands out and becomes an interesting visual element. Captions are clear and concise.	
Model (double points)						24 pts possible
Created	Missing	Model is partially complete	Model is not quite finished, or falling apart	Model of one mission created	Model of 2 missions created	
Neatness	Missing	Sloppy edges or folds; falling apart	Mostly well folded, cut, or glued. Holds together	Well-built model. Neat edges. Clean glue work. Sturdy.	Added extra. A stand? A diorama scene? More? Impress your audience!	
Informative	Missing	Model is shown	Model is mentioned in presentation	Significance of mission and accurate presentation of knowledge gained or sought	Model(s) drives the presentation as a tool for discovery as each factoid is presented as the answer to an exploratory question	
TOTAL POINTS						104

Grading Rubric

Solar System Exploration Project Quiz #1

1. Who is your partner?

2. What planet/solar body are you studying?

3. How far from the sun is that?

4. When is the first recorded sighting of it?

5. Name 2 missions humans have used to study that planet/solar body?

6. How big will your scale sculpture be?

7. How did your planet/solar body get its name?

8. How many moons does your planet/solar body have?

9. Describe one amazing fact about your planet/solar body.

10. Explain why or why not you would choose to live there.

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