Name: For the teacher _____ Date: _____ Class: _____

Mission Reflection Example Answers

D: How many aliens did you find? **Answers will vary. You know the possible maximum number.**

E: Reflect on the strengths and weaknesses of your performance in the activity. How would you improve your performance next time?
Responses will vary.

F: Which space agency found the most aliens? What about their strategy made this possible?
Responses will vary.

G: Did you have any issues communicating with the robot? You used a remote control to give the robot commands. How do researchers communicate with robots that are vast distances away from the Earth?
Ideally, robots that are far away from Earth can run autonomously, meaning they can control themselves and make navigational decisions. To communicate with the robots, often researchers send signals via a satellite network.

H: Provide examples of how you used the engineering design process during this simulation.
Responses will vary. EDP steps include identifying the problem, researching, brainstorming solutions, testing solutions, redesign solutions, etc.

I: How would this simulation be different if you could see where the robot was located?
Responses will vary.

J: How is this simulation realistic? Unrealistic?
It is realistic because it is like what engineers really did when testing the Icefin robot. They had to control the robot from a distance and used cameras to see what the robot saw. It is unrealistic because the equipment was much simpler.

K: If you used Livestream to record the robot, you had to deal with a 20-second time delay when using the live feed. Is this a real challenge we have with space exploration? How would delays affect researchers looking to make discoveries in outer space? Explain.
Communication delays are a reality of space exploration. For example, communicating with a Mars rover can take more than 2 hours, one way, which makes the operation very slow. Robots going even further distances must be autonomous so they they do not have to wait for commands from Earth to tell them what to do.

L: The Icefin was tested in Antarctica. Do you think that environment is a good model for Europa? Compare and contrast the two places as you support your answer.
Europa and Antarctica are both cold environments that are covered in ice and contain an ocean under the ice. However, Europa is significantly colder and it is believed the ice could be dozens of miles thicker. Antarctica is the best natural model we have on Earth, but Europa is much more extreme.

M: If your robot was going to Europa, what are some design constraints you would have to consider based on the conditions there?
Responses will vary; one example is provided here. The robot must be able to withstand below-freezing conditions, water and ice. It must be able to drill through very thick ice without getting stuck. It must be designed so the electronics are not damaged by those conditions.

N: What types of engineers might be involved in a robot mission to Europa? If you were an engineer on the Europa team, what would your job involve? What skills do you already have to do that job? What skills do you need to learn?
Answers will vary; some examples of engineers include computer engineers, electrical engineers, aerospace engineers, mechanical engineers, software engineers, systems engineers, etc.