

## Lesson Implementation and Reflection

While exploring [Mars lesson resources](#), I came across a NASA JPL lesson designed around the MARS Curiosity rover to help students learn more about the purpose of rovers and how they are controlled. I modified [this lesson](#) to focus on Perseverance and be compatible with virtual learners.

To begin, I showed students a [clip](#) of the Mars Perseverance rover landing on February 18th. Then, I followed the suggested lesson procedure by asking students what they recall about Mars from our space unit, and what they know about the rovers that are on Mars / what the purpose of the rovers is. Next, I had the students visit [NASA Space Place](#) to read a little bit about Mars and the Perseverance rover. We came back together as a class to share what we learned about the work rovers do in space and what the goal of Perseverance is. After that, I gave the students time to explore the [Mars Perseverance website](#) to learn more about Perseverance's mission and the structure of the rover itself. The students then shared fascinating facts about Perseverance and the tools it is equipped with. This led us into a discussion of how the rover is controlled and we watched a NASA "[Mars in a Minute](#)" video about how scientists and engineers drive the rovers. The students were then informed that they would be simulating the work of NASA scientists and engineers by commanding the rover themselves through a game. Each student logged into the [Explore Mars](#) game on NASA Space Place to try their hand at coding commands for the rover to collect data. Afterwards, the students completed a debriefing form to share what they found to be challenging, what they found to be easy, and the factors that affected the success of the mission. To elaborate on their learning, the students were given time to peruse some of the real data that has been collected about Mars by exploring [Google Mars](#).

I really enjoyed implementing this lesson, and found it to be a wonderful anchoring phenomena for the Earth science unit my students are beginning related to learning about the geosphere and the history that is recorded in rocks. This lesson also resonated with my students as it led them to raise many questions about rovers in general, Perseverance, and how rocks are used to detect signs of life. While debriefing, many students shared that they loved looking at the 3D model of Perseverance. They also shared that they recognized how much planning has to go in to making a mission successful after playing the game.

Something I really liked about this lesson, pedagogically speaking, is how it was framed around the 5E structure so students were immediately engaged and had the chance to explore the concept in a hands-on/minds-on way. I also love that it included debriefing questions to help students be meta-cognitive about their learning, and how it included "authentic space data" students could analyze during the elaboration stage of the lesson.

While I did keep the basic sequence of the lesson the same, I strayed quite a bit from the original JPL lesson, as comparison of the two will show, by bringing in additional NASA resources, making it more relevant to Perseverance, and cutting out the board game to make it

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March 04, 2021

more “virtual learner-friendly”. Post COVID-19 / virtual learning, it will be interesting to try this lesson using the suggested board game.

Resources Referenced:

Educator guide: Mars Rover driver board game. (2020, January 07). Retrieved March 04, 2021, from <https://www.jpl.nasa.gov/edu/teach/activity/mars-rover-driver-board-game/>

Google Mars. (n.d.). Retrieved March 04, 2021, from <https://www.google.com/mars/>

Mars 2020 Perseverance rover. (n.d.). Retrieved March 04, 2021, from <https://mars.nasa.gov/mars2020/>

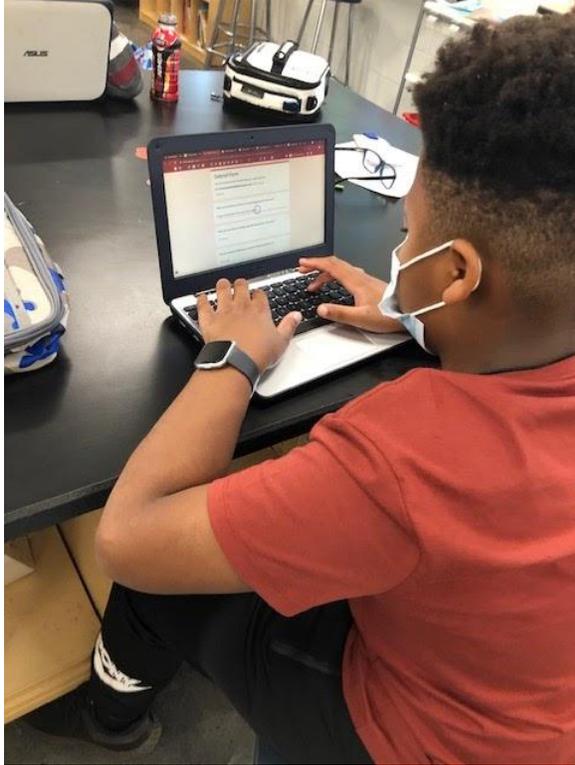
Mars in a Minute: How DO Rovers drive on Mars? (2015, April 29). Retrieved March 04, 2021, from <https://youtu.be/e6vzjNkDB5k>

Perseverance rover's descent and touchdown on MARS (official nasa video). (2021, February 22). Retrieved March 04, 2021, from <https://youtu.be/4czjS9h4Fpg>

Stoller-Conrad, J. (Ed.). (2016, February). Home. Retrieved March 04, 2021, from <https://spaceplace.nasa.gov/>

*See student artifacts below.*

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Student completing the debrief form.



Student playing the rover game.

What was hard about writing command sequences for the rover?

It was hard to be at just the right angle to the rock so that I could discover what was in it. I also found it hard to go around a rock. A third thing that I found hard is moving the right amount of spaces

1 response

You had to be precise with the commands. If you went one space over the mark then you couldn't analyze. Also sometimes you would "miss" the sample and you couldn't get it and you only had a few commands.

1 response

Did your sequence always go as planned? What could affect it?

It did not always go as planned. Rocks in the way was one thing that affected it. Another hard obstacle was getting to one or more rocks in just six moves.

1 response

My sequence did go to plan, but on the real rover, maybe connection could get lost. It could go into a rock or something that could jeopardize the plan.

1 response

Sample of student debrief responses.