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| Connecting to the Next Generation Science Standards (NGSS Lead States 2013)3-5.Engineering Design[*https://www.nextgenscience.org/topic-arrangement/3-5engineering-design*](https://www.nextgenscience.org/topic-arrangement/3-5engineering-design)The chart below makes one set of connections between the instruction outlined in this article and the *NGSS*. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities. The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectation listed below.Performance Expectation: 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. |
| Dimension | Connections to Classroom Activity |
| Science and Engineering Practice |  |  |
| Constructing Explanations and Designing Solutions* Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.
 | Students generated multiple solutions to the packing, landing, and roving challenges. Students developed explanatory justifications for how their solutions met, or failed to meet, criteria for success. |
| Disciplinary Core Idea |  |
| **ETS1.A: Defining and Delimiting Engineering Problems*** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

**ETS1.B: Developing Possible Solutions*** At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)
 | For each challenge students faced multiple constraints, like crew limitations for the packing challenge or NASA’s engineering and science criteria for choosing a landing site, and had the opportunity to propose multiple solutions and compare their solutions with others to see how well their solution took into account the mission constraints.Students made their thinking visible by sharing proposed solutions and explained their reasoning for how their proposed solutions fit NASA’s mission criteria. |
| **Influence of Engineering, Technology, and Science on Society and the Natural World** |  |
| Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. | Students developed their own mission plan to increase the scientific merit of their mission and used engineering-based systems thinking to decrease known risks to the humans and rovers. |

**Connections to the *Common Core State Standards* (NGAC and CCSSO 2010):**

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| **CCSS.ELA.RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. | Students read from high quality non-fiction books and NASA websites related to the exploration of Mars. |
| **CCSS.Math.Practice.MP2** Reason abstractly and quantitatively. | Students reasoned abstractly about the problems of generating a rover route on Mars and calculated their proposed route’s efficiency with respect to gathering scientific data. |