You will know the level to which your students have achieved the Learning Outcomes, and thus the Instructional Objective(s), by using the suggested Rubrics below.

**Instructional Objective 1: To produce a presentation that aligns with criteria**

**Related Standard(s) (will be replaced when new NRC Framework-based science standards are released):**

National Science Education Standards (NSES)
(E) Science and Technology: Abilities of Technological Design

Technological designs have constraints. Some constraints are unavoidable (e.g., properties of materials, or effects of weather and friction); other constraints limit choices in the design (e.g., example, environmental protection, human safety, and aesthetics). (Grades 5-8: E2e)

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Expert</th>
<th>Proficient</th>
<th>Intermediate</th>
<th>Beginner</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO1: Explain how proposed scientific and technological solutions address environmental and other constraints</td>
<td>Explanation is grounded in sound and insightful scientific and technological facts and theory.</td>
<td>Explanation is grounded in sound scientific and technological facts and theory.</td>
<td>Explanation is grounded in mostly sound scientific and technological facts and theory.</td>
<td>Explanation is not grounded in sound scientific and technological facts and theory.</td>
</tr>
</tbody>
</table>
Societal challenges often inspire questions for scientific research, and social priorities often influence research priorities through the availability of funding for research. (Grades 5-8: F5b)

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<tr>
<td>LO2: Summarize how priorities in the design address societal challenges per criteria</td>
<td>Summary of how priorities address societal challenges is clear and insightful.</td>
<td>Summary of how priorities address societal challenges is clear.</td>
<td>Summary of how priorities address societal challenges is mostly clear.</td>
<td>Summary of how priorities address societal challenges is unclear.</td>
</tr>
<tr>
<td>LO3: Explain how technologies address societal challenges within constraints</td>
<td>All technological solutions clearly link to a problem.</td>
<td>Most technological solutions clearly link to a problem.</td>
<td>Few technological solutions link to a problem.</td>
<td>Technologies are superfluous and not linked to a problem.</td>
</tr>
</tbody>
</table>
**Related Standard(s)** (will be replaced when new NRC Framework-based science standards are released):

**21st Century Skills. Communication and Collaboration: Communicate Clearly.**

Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.

**Related Rubrics for the Assessment of Learning Outcomes Associated with the Above Standard(s):**

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<tr>
<td>LO4: Critique presentation skills per criteria</td>
<td>Critique of presentation skills is honest and accurate. Critique informed all improvements.</td>
<td>Critique of presentation skills is accurate. Critique informed some improvements.</td>
<td>Critique of presentation skills is mostly accurate. Critique informed few improvements.</td>
<td>Critique of presentation skills lacks accuracy. Critique informed very few improvements.</td>
</tr>
<tr>
<td>LO5: Execute communication per criteria</td>
<td>Presenter used most Presentation Tips to deliver a well-conducted talk; communication of the design, its constraints, and the problems it solves was extremely clear.</td>
<td>Presenter used many Presentation Tips to deliver a well-conducted talk; communication of the design, its constraints, and the problems it solves was very clear.</td>
<td>Presenter used some Presentation Tips to deliver a fairly well-conducted talk; communication of the design, its constraints, and the problems it solves was clear.</td>
<td>Presenter used few Presentation Tips to deliver a talk; communication of the design, its constraints, and the problems it solves was not clear.</td>
</tr>
</tbody>
</table>
This lesson adapts Anderson and Krathwohl's (2001) taxonomy, which has two domains: Knowledge and Cognitive Process, each with types and subtypes (listed below). Verbs for objectives and outcomes in this lesson align with the suggested knowledge and cognitive process area and are mapped on the next page(s). Activity procedures and assessments are designed to support the target knowledge/cognitive process.
The design of this activity leverages Anderson & Krathwohl’s (2001) taxonomy as a framework. Pedagogically, it is important to ensure that objectives and outcomes are written to match the knowledge and cognitive process students are intended to acquire.
LESSON 14: SHARING DESIGNS OF SUSTAINABLE COMMUNITIES ON MARS

(E) Teacher Resource. Placement of Instructional Objective and Learning Outcomes in Taxonomy (3 of 3)

The design of this activity leverages Anderson & Krathwohl’s (2001) taxonomy as a framework. Below are the knowledge and cognitive process types students are intended to acquire per the instructional objective(s) and learning outcomes written for this lesson. The specific, scaffolded 5E steps in this lesson (see 5.0 Procedures) and the formative assessments (worksheets in the Student Guide and rubrics in the Teacher Guide) are written to support those objective(s) and learning outcomes. Refer to (E, 1 of 3) for the full list of categories in the taxonomy from which the following were selected. The prior page (E, 2 of 3) provides a visual description of the placement of learning outcomes that enable the overall instructional objective(s) to be met.

At the end of the lesson, students will be able

IO1: to produce design presentation that meets criteria

6.3: to produce
Bc: knowledge of theories, models, and structures

To meet that instructional objective, students will demonstrate the abilities:

LO1a: to explain design solutions
2.7: to explain
Bb: knowledge of principles and generalizations

LO1b: to summarize design priorities
2.4: to summarize
Ab: knowledge of specific details and elements

LO1c: to explain how technologies meet needs
2.7: to explain
Bc: knowledge of principles and generalizations

LO1d: to critique skills against criteria
5.2: to critique
Cb: knowledge of criteria for when to use appropriate procedures

LO1e: to execute criteria-based presentation
3.1: to execute
Da: strategic knowledge