



# Middle School Green Career Awareness Module

## Sustainable and Resilient Communities



Solutionary Phase	Solutions
Lesson # and Title	Lesson 13-14: Solutionary Design Challenge Showcase and Design Iteration
Duration	45 minutes

### Lesson Overview

In these lessons, students will showcase their design challenge solutions to their classmates, highlighting their innovative and sustainable approaches to addressing real-world problems. Students will have the opportunity to present their design challenge solutions and demonstrate their understanding of the problem, their design process, and the rationale behind their chosen solutions. The showcase will serve as a platform for students to articulate their ideas, showcase their creativity and critical thinking skills, and engage with their peers on key ideas. Following the presentations, students will engage in a community redesign process, either as a whole class or in small groups. They will identify common patterns and incorporate best practices from other designs. Through reflection and collaboration, students will refine their designs, promoting critical thinking and communication skills. By participating in the design challenge showcase, students will gain valuable experience in presenting and defending their ideas, receiving feedback, and engaging in thoughtful discussions. The showcase will foster a sense of pride and accomplishment, inspiring students to continue their solutionary endeavors and apply their skills in future projects and endeavors. The lesson also encourages iterative problem-solving and civic engagement.

### Learning Objectives

1. Students will demonstrate effective communication and presentation skills during the design challenge showcase, as measured by their ability to articulate their ideas, showcase creativity and critical thinking, and engage in thoughtful discussions with peers, resulting in a compelling and persuasive presentation of their design solution.

2. Students will analyze and evaluate their own design challenge solutions. Students will also assess the effectiveness of their problem understanding, design process, and rationale, in order to improve and refine their solutions.
3. Students will actively engage in the community redesign process by collaboratively identifying common patterns and incorporating best practices from other designs, utilizing critical thinking and decision-making skills to create a refined and improved design solution.

### Content Standard(s)

#### **CA Next Generation Science Standards (NGSS)**

- NGSS Disciplinary Core Ideas (DCI): Earth's Systems (ESS2); Human Impact on Earth Systems (ESS3.C); Earth and Human Activity (ESS3); Engineering Design (ETS1)
- NGSS Science and Engineering Practices (SEPs): Asking questions (for science) and defining problems (for engineering); Analyzing and interpreting data; Using math and computational thinking; Constructing an explanation (for science) and designing a solution (for engineering); Engaging in an argument stemming from evidence; Obtaining, evaluating, and communicating information
- NGSS Cross Cutting Concepts (CCCs): Patterns; Cause and effect; Scale; Proportion, and quantity; Systems and system models; Stability and change

#### **CA Common Core ELA: Reading, Writing, Listening and Speaking and Language - [Portrait of an ELA Student Outcomes](#) (pdf page 12):**

- E3. Obtain, synthesize, and report findings clearly and effectively in response to task and purpose.
- E4. Comprehend as well as critique.
- E5. Read, write and speak grounded in evidence.
- E7. Come to understand other perspectives and cultures through reading, listening, and collaborating.

#### **CA Common Core Math [Practices, Domains and Conceptual Categories](#):**

- Math Practices: 1. Make sense of problems and persevere in solving them; 2. Reason abstractly and quantitatively; 3. Construct viable arguments and critique the reasoning of others; 5. Use appropriate tools strategically; 6. Attend to precision
- 6-8 Math Domains: Ratios and Proportional Relationships (6-7); Expressions and Equations (6-8); Geometry (6-8); Statistics and Probability (6-8)

#### **CA History Social Studies Key Themes ([Appendix B](#)):**

- Key Theme 1: Patterns of Population
- Key Theme 4: Haves and Have Nots
- Key Theme 6: Science, Technology, and the Environment

#### **CA Health Standards ([Content Areas and Standards](#)):**

- Health Content Areas: 6) Personal and Community Health
- Health Overarching Standards: Standard 1: Essential Health Concepts; Standard 5: Decision Making

**CA CTE Standards for Career Ready Practice** (pdf page 19-20):

- 1. Apply appropriate technical skills and academic knowledge.
- 2. Communicate clearly, effectively, and with reason
- 3. Develop an education and career plan aligned with personal goals.
- 5. Utilize critical thinking to make sense of problems and persevere in solving them.
- 9. Work productively in teams while integrating cultural and global competence.
- 10. Demonstrate creativity and innovation.
- 11. Employ valid and reliable research strategies.
- 12. Understand the environmental, social, and economic impacts of decisions.

**CA Environmental Principles and Concepts** (EP&Cs): Principles I - V

Equipment, Instructional Resources, and Materials

- Computers or laptops for students to create digital presentations
- Projectors or screens for practice presentations
- Podium or speaking area for presenters
- Timer or clock to keep track of presentation time
- Question and answer sheets or cards for the audience
- Note-taking materials for audience members
- Whiteboards or large chart paper for visualizing ideas and collaborative design sessions
- Markers, pens, and sticky notes for brainstorming and capturing ideas
- Rubrics or scoring guides for assessing presentation content and delivery
- Evaluation forms or surveys for collecting feedback from the audience
- Assessment tools or checklists for self-reflection and evaluation by students

Key Vocabulary and Terms

- Design Challenge: A problem or task that requires students to use their creative and critical thinking skills to develop innovative solutions.
- Design Process: A systematic approach to problem-solving that involves identifying needs, generating ideas, developing prototypes, testing, and refining solutions.
- Rationale: The underlying reasoning or justification behind a particular decision, choice, or solution.

- Civic Engagement: Active participation in the community, involving individuals taking responsibility for shaping and influencing public decisions and policies.
- Consensus Building: The process of reaching an agreement or shared understanding among a group of people with different perspectives or interests.
- Feedback: Constructive information, opinions, or comments provided to individuals or groups to help them improve their work, performance, or ideas.
- Iteration: The act of repeating a process or cycle, making incremental improvements or adjustments with each repetition.
- Showcase: An event or platform where students have the opportunity to present and exhibit their work or solutions to an audience.
- Solution Evaluation: Assessing the effectiveness, feasibility, and impact of a proposed solution based on defined criteria and objectives.
- Community Engagement: Involving community members in decision-making processes and seeking their input, participation, and collaboration in community development initiatives.
- Best Practices: Strategies, techniques, or approaches that have proven to be effective and efficient in achieving desired outcomes or goals.

#### Teacher Preparation

Create a numbered list of tasks that a teacher would need to perform to effectively prepare to teach this lesson. For example:

1. Review the lesson procedure and slide deck ([Solutions Slide Deck](#))
2. Assemble the presentation and feedback supplies and materials
3. Assemble the materials for the community redesign

#### Lesson Procedure

Slide Deck: [Solutions Slide Deck](#)

Segment Title	Activity/Task and Student Grouping	Time (min)
<b>Presentation Practice</b>	<b>Activity/Task:</b> Students will practice their presentations, ensuring that they clearly communicate their problem statement, their design process, and the sustainable and solutionary elements of their solution. During this practice, students will refine their communication skills and ensure their ideas are effectively conveyed. Teachers may offer the following options for presentation preparations:	Time varies based on the preparation option that

	<ul style="list-style-type: none"> <li>• Option #1: Full period for preparations a day in advance</li> <li>• Option #2: Homework preparations - encourage students to video themselves presenting and review ahead of final presentation</li> <li>• Option #3: Day of preparation: 10-15 minutes to practice ahead of the presentation</li> </ul> <p><b>Student Grouping:</b> Small Group</p>	teachers select
<b>Showcase Presentation</b>	<p><b>Activity/Task:</b> The showcase event will be held either within the classroom or in a larger setting, depending on space needed. Students will have the opportunity to present their solutions to fellow classmates, and teachers. Additional guests such as administrators, parents, community members, and potentially experts from relevant fields may also attend.</p> <ul style="list-style-type: none"> <li>• After each presentation, there will be a question and answer session where the audience can ask clarifying questions or seek additional information. This exchange will provide an opportunity for students to demonstrate their understanding, engage in critical thinking, and receive constructive feedback.</li> <li>• Immediately following the initial presentation students will reflect on their presentation and design and evaluate their own performance, identifying areas of growth and improvement.</li> <li>• Educators may also provide feedback and assessment on the students' presentations, addressing both the content and delivery aspects.</li> </ul> <p><b>Student Grouping:</b> Small Group</p>	One full period
<b>Iteration and Community Redesign</b> <i>(Optional)</i>	<p><b>Activity/Task:</b> The purpose of the redesign is to incorporate best practices and ideas from the different groups. This lesson extension reinforces real-world design practices, and the importance of civic engagement and consensus building within a community. Students may redesign either as a whole class or in their small groups - the instructor should choose one of the following processes for the redesign:</p> <ul style="list-style-type: none"> <li>• <b>Option 1 - Whole Group Design:</b> Upon completion of the showcase the whole class will identify common patterns amongst all designs, and unique elements of each design that stood out as best practices. The class will then co-create a final design that meets criteria and incorporates ideas from each of the groups. This design process should be facilitated by the instructor, and would involve a large whiteboard or chart paper that everyone can easily see and contribute ideas to. Instructors should consider that a large group brainstorming and design session can be very challenging, and it is easy for students to lose interest if they are not engaged frequently. It is encouraged that the lead facilitator</li> </ul>	1-2 Periods

	<p>utilizes various forms of decision making and consensus techniques throughout the time period such as partner/small group discussions and voting.</p> <ul style="list-style-type: none"><li>● <b>Option 2 - Rapid Prototype of Team Design:</b> Each team will redesign their community to incorporate some of the ideas and best practices from other designs that they saw. Instructors should note that students may have a very difficult time “throwing out” their old design and creating something new. The lead facilitator will need to highly scaffold the design time to support brainstorming, redesign, and moving things forward, as there will be students in each group who are very tied to their old design.</li></ul> <p><b>Student Grouping:</b> Small Group</p>	
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