Innovation Curriculum

Classroom Lesson 5

Iterate, Refine, Present

Lesson Overview
Students will conclude the GSA Innovation Process by completing the following steps: 1) modify their solutions based on their test results, and retest if possible; 2) make any final revisions; 3) present their solutions

Lesson 5: Iterate, Refine, Present

Lesson Overview: Students will conclude the GSA Innovation Process by completing the following steps.

1. Modify their solutions based on their test results, and retest if possible
2. Make any final revisions
3. Present their solutions

Time Frame: 2–4 weeks

- Part 1: Iterate - 45–60 min (in class), 1–2 weeks (outside class)
- Part 2: Refine - 45–60 min (in class)
- Part 3: Present - 75–90 min (in class); 1–2 weeks (outside class)

Core Concepts

- Initial design solutions are rarely perfect or final
- Iterating improves a solution and makes it more responsive to users' needs
- There are many possible ways to test a solution
- A solution can be revised and refined according to feedback obtained from testing it

Lesson Objectives

Students will be able to:

- Modify their solutions according to their test results
- Retest their modified solutions
- Refine and finalize their solutions based on multiple rounds of testing
- Create thorough and effective presentations of their solutions

Lesson Inquiry Question: What is the value of iterating?

Materials Needed

- Journals (optional)
- Supplies for modifying models/prototypes (will vary)
- Copies of any resources below that you wish to share with students
- PowerPoint or other software for making slideshow presentations
- Sample Report—see Appendix D
- Success Rubric—see Appendix E

Journal Opportunity (optional)

As they complete this lesson, students who are keeping science journals may want to do the following:

- Record how their thinking about their solutions changed over the course of several iterations
- Summarize what they learned from the process as a whole

NGSS Alignment

Lesson 5 provides opportunities for students to engage in the following Science & Engineering Practices (SEPs).

- ***Practice 1*** – Asking Questions & Defining Problems
- ***Practice 2*** – Developing & Using Models
- ***Practice 3*** – Planning & Carrying Out an Investigation
- ***Practice 4*** – Analyzing & Interpreting Data
- ***Practice 5*** – Using Mathematical & Computational Thinking (*depending on design/ prototype*)
- ***Practice 6*** – Constructing Explanations & Designing Solutions
- ***Practice 7*** – Engaging in Argument from Evidence
- ***Practice 8*** – Obtaining, Evaluating & Communicating Information

This lesson is directly aligned with the following Performance Expectations.

- ***HS-ETS1-2.*** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Educators may align the lesson to additional Performance Expectations and/or Disciplinary Core Ideas (DCIs) through challenge selection and/or the provision of specific related research resources.

Part 1: Iterate

Estimated Time
45–60 minutes (in class)
1–2 weeks (outside class)

Preparation: Return Deliverable 4 to each team with your feedback, and ask students to review their plans for modifying and retesting their solutions.

Procedure
1. Have students modify their solutions according to their test results and your feedback on Deliverable 4. Share the following resource to guide them.

- Integrate Feedback and Iterate: IDEO's Design Kit provides four steps for integrating feedback and creating the next iteration of a design solution

2. Encourage students to retest their modified solutions, if time permits, following the same procedure outlined in Lesson 4, but making any necessary modifications to improve their testing methods.

3. Have students analyze their new data and feedback, and repeat the process of modifying, retesting, and analyzing as time permits.

4. Students should continue to document their iterations using photos and/or video for use in their final presentations.

Part 2: Refine

Estimated Time
45–60 minutes (in class)

1. Once students have completed their final round of testing, ask them to analyze their latest data and feedback.

2. Encourage students to review their previous iterations to identify the most effective elements of their solutions.

3. Invite students to complete any final revisions to their solutions. Revisions should be based on testing and analysis. What worked? What didn't work? What solution will they present as a response to the challenge? This ultimate solution may be written out or represented by a visual or physical prototype.

4. Students should take photographs and/or video of their solutions to use in their final presentations.

Feedback Opportunity: Before they begin work on their final presentations, meet with teams to review their solutions, offering guidance on any final questions or issues they may have.

Part 3: Present

Estimated Time

30 minutes (in class, to introduce the task)
1–2 weeks (outside class, to prepare presentations)
45–60 minutes (in class, for students to present)

Preparation: Explain to students that they will now create final presentations of their solutions. They may choose to create a brief slideshow (approximately 15–20 slides) or video (approximately 2 minutes). Each presentation should include the following elements.

- **Problem:** State the problem you tried to solve
- **Background:** Summarize any relevant research or background information, and be sure to cite your sources
- **Hypothesis:** State the hypothesis you investigated
- **Methods:** Describe the methods you used to collect data or feedback
- **Results:** Summarize the results of your testing
- **Solution:** Describe your solution

Help students gather any supplies or resources they may need to complete their presentations. Share the Sample Report (Appendix D) as a model. This presentation describes how a student improved and tested the design of a paper helicopter.

Procedure

1. Allow enough time for teams to complete their presentations.

2. Have each team present their solution to the class.

3. To conclude the project, have teams submit their final work to you and via Launchpad (if they are participating in a current challenge). Each submission should include the following items.

- The team's final slideshow or video presentation
- A short (1 page or less) executive summary that outlines the problem, the hypothesis, and a brief overview of the solution
- A brief summary (1 page or less) **from each team member** describing the experience of working with his/her team and mentor, if applicable

4. If you plan to evaluate students' work yourself, use the Success Rubric (Appendix E) to guide you.

Terms and Concepts

- ***iterate*:** to perform repeatedly

Additional Resources

Present

Students may find the following resources helpful when creating their presentations.

- How to Create a PowerPoint Slide http://www.readwritethink.org/files/resources/lesson_images/lesson1063/CreatingPowerPointSlide.pdf
- How to Create a PowerPoint Presentation http://www.instructables.com/id/How-to-Create-a-PowerPoint-Presentation/
- How To Make An Amazingly Professional PowerPoint Presentation https://www.youtube.com/watch?v=iqI149PD4v4
- How to Turn Your Presentation Into a Video https://support.office.com/en-us/article/Turn-your-presentation-into-a-video-c140551f-cb37-4818-b5d4-3e30815c3e83
- How to Create Video Presentations https://www.movavi.com/support/how-to/how-to-create-video-presentation.html

Lesson 3 Hyperlink Index

Integrate Feedback and Iterate: IDEO's Design Kit provides four steps for integrating feedback and creating the next iteration of a design solution. http://www.designkit.org/methods/4