



Not One Size Fits All

Content Focus: Language Arts

- Reading: Comprehension
- Writing: Technical







Content Focus: Built Environment

- Architectural Drawing / 2D
- Compression/Tension
- Stress

Performance Outcome(s)

- Write a specification for a new invention for your classroom.

Standards/Interdisciplinary Connections

					
S	S	L	A	M	T
Science	Social Studies	Language Arts	Art - Visual	Math	Technology

How To Read The Symbols: The symbols in **bold** indicate the subject standards that this lesson satisfies.

Lesson Outline (multiple-lesson project)

1. Motivation
2. The Challenge
3. Research Materials And Processes
4. Write A Product Specification
5. Present
6. Reflection
7. Extensions And Variations
8. Middle School Standards

Salvadori Prerequisites

- FOUNDATION - BASIC SKILLS: Architectural Drawing / 2D (Activity #1)
- FOUNDATION - STRUCTURES 101: Push and Pull; Stress Test



CONCEPTS

- Writing detailed instructions can help the student develop a clear, descriptive, focused writing style.
- The ability to write and follow instructions and specifications is a skill applicable to every educational discipline and future career.
- Explaining the design process is as much verbal as visual, and the ability to present one's ideas in words and not just images is crucial in any design endeavor.

RESOURCES

On-Line

- <http://www.csinet.org/> - The Construction Specifications Institute
- <http://www.astm.org> - International Standards Worldwide
- <http://www.ansi.org> - American National Standards Institute

Books

- Reznikoff, S.C., *Interior Graphic and Design Standards*, Whitney Library of Design: New York, New York, 1986

MATERIALS

Facilitator

- ●: Q&A

Students

- ●: Student Guide: Product Specification
- Paper, pencils, colored pencils or markers

MOTIVATION

Take a look around the classroom. Observe all of the objects within the room that we use to help us in our day-to-day activities. In your mind, choose one of these objects.

From your seat, notice as much as you can about the object, including its size, shape, color, the materials it is made of, etc.



For a moment, imagine you are an alien that has just arrived on planet Earth and that you are looking at the object for the first time. Without knowing what it is used for, how would you describe it to a fellow alien?

Write a detailed description of the object you have chosen without naming the object, or revealing its purpose or location in the room. Include as many of its physical characteristics as you can.

Exchange your description with that of another student. Guess what the object is based on your partner's description.

- *Which clues were most helpful?*
- *Would it be easier or more difficult to determine what the object was if you were given a drawing instead of a written description? Why?*
- *What are some things that can be included in a written description that cannot be communicated in a drawing and visa-versa?*
- *When a designer develops a new product, how do you think s/he communicates the information about how to make the product to the manufacturer? ●:Q&A*

THE CHALLENGE

Students think about the hundreds of products they come across and use during a typical school day. These can include items within the classroom, the cafeteria, the gym, the library, etc. Encourage them to think of simple products.

- *Are there any items that you use on a regular basis at school that you feel are inadequate, uncomfortable, dangerous, or just somehow unsatisfactory?*
- *Can you think of any way to modify those items to make them better? ●: Q&A*
- *Can you come up with an idea for an entirely new object that would fulfill the same purpose, but do it better?*

Be creative! Your invention can be a really cool sophisticated gadget, or a simple gizmo no one has thought of before. You can combine two items into one, like making a stapler/flashlight, or design something fully automated: what would a self-sharpening pencil look like? Or better yet, how about a homework machine?

1. Give students some time to develop an idea for a modification to an existing product or an entirely new product to be used in the school setting.
2. Students do a few sketches of their invention to clarify how it will work and the materials and pieces it will be made of.
3. Students name their inventions.



RESEARCH MATERIALS AND PROCESSES

You have devised a brilliant invention that will revolutionize your school experience. Now, imagine you wanted to get your invention manufactured.

- *How would you communicate your ideas to the factory that would make your product?*
- *What are some things about your invention that are difficult to communicate with just your drawings?*

Your challenge is to write a specification for your new invention. A specification is a detailed description of a design, its materials, and the methods used in its construction.

- *What are some things you will need to include in your specification?*
1. Distribute the student guide. ●: Student Guide: Product Specification
 2. Students list all of the separate pieces that are needed for the product. For each piece they note the dimensions, the material it is made of and its color.
 3. Students review the student guide and make a note of all the information they will have to research further. Students then research materials. For example, if certain pieces are to made of plastic, they use the internet to research different types of plastic and their properties.

WRITE A PRODUCT SPECIFICATION

1. In groups, students share the fruits of their research into materials and their properties. Students compare their notes and discuss which types of materials would be most appropriate for each invention.
2. With the help of the student guide, students write their product specifications. Although it is a technical document, encourage them to be as descriptive as possible.
3. Students swap their specifications to have other students review it for clarity, descriptiveness, and conciseness. Reviewers should be able to make a rough sketch of the invention based on the specification.

PRESENT

- Students present their work to the rest of the class, describing their invention, how it works, what it is made of, and what they learned during the course of their investigations.



REFLECTION

- *Did you find it difficult to describe something in detail that exists only in your imagination? Why or why not?*
- *What are some things you could have done that would have made the visualization process easier?*
- *Can you think of any other considerations (besides the ones you included in your specification) that real product designers would have to think about as they design a product?*
- *Is there anything you learned about the properties of materials during the exercise that you had not previously known?*
- *Did you find you were able to be creative in your writing style and word choice as you wrote the instructions?*
- *How well did you meet your challenge? What would you do differently next time?*

EXTENSIONS AND VARIATIONS

- Students build full-scale and, if possible, functional models of their inventions.
- Students write patents for their inventions (see School: Design Writes).
- Students develop a proposal to renovate or modify an existing area in the school building or classroom. After making a scale model, students write a design specification for the remodeling and present their proposal to the school administration. Architectural magazines can be helpful to get ideas and to learn about materials and the companies that supply them.

MIDDLE SCHOOL STANDARDS

Language Arts

- Reading (E1e)
- Writing (E2a, d)
- Speaking, Listening, and Viewing (E3a, b, c)
- Conventions, Grammar, and Usage of the English Language (E4a, b)

MOTIVATION

- *When a designer develops a new product, how do you think they communicate the information about how to make the product to the manufacturer?*

A designer must submit detailed drawings (these days the drawings are done on a computer using 3-D digital design and rendering software) along with a written description of the materials to be used and details regarding manufacture and safety. This document is called a *specification*.

THE CHALLENGE

- *Can you think of any way to modify those items to make them better?*

If students are having trouble imagining a modification to an existing product, give them some examples. Mechanical pencils are an example of an item that has the same function as an existing item but (depending on personal preference) can be seen as an improvement.

Not One Size Fits All

Product Specification

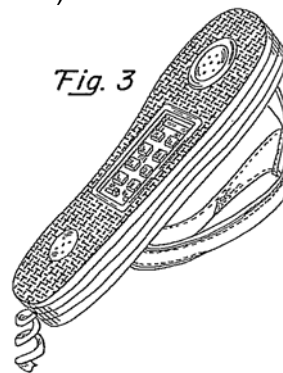
What information will you need to communicate to the factory that will make your invention? How will you make sure that your designs are followed and that the product is well-made and safe to use?

Designers write **specifications** to communicate the information to the people who actually make the products.

You can use the following format to structure your specification. If you can think of any other important information, include it as well.

1. Product Overview
 - a. Product Name
 - b. Product Description: Function (including any moving parts)
 - c. Product Description: Overall dimensions, number of separate parts, and appearance
2. Piece-by-Piece Description - For each piece describe the following:
 - a. Its dimensions
 - b. Its material (be as specific as possible. For example, if it is made of metal, what type of metal?)
 - c. Its color
 - d. Its surface finish (for example, is it polished, rough, textured? If so, how? Be as descriptive as possible).
 - e. Its structure (for example, if it is a hollow plastic piece, will it have thicker sections on the inside to make it stronger?)
 - f. How it moves (if it moves)
 - g. How it is attached to the other pieces (it may be helpful to look around at items in the room to see how the separate pieces are attached. Options include gluing, welding, clasps, snaps, Velcro, screws, etc.)

A wacky invention: the
flip-flop telephone



Not One Size Fits All

Product Specification

3. Safety Specifications - Think of all the possible safety issues that must be considered in making the product (you wouldn't want anyone to get hurt using it!)
 - a. Does it use electricity? If so, describe how it will protect people from electrical current and how the materials will react to the heat associated with electrical current.
 - b. Could it be used in any environment where there might be an open flame (such as a science lab)? If so, describe how the materials will be flame-retardant.
 - c. Could it be used in any environment with very young children? If so, describe how you will prevent small pieces, which may pose a choking hazard, from breaking off.
 - d. Could it be used in any way that would put pressure or impact on the product? If so, describe how it will withstand these forces without breaking.

4. (Optional) Manufacturing specifications

This is an important part of any specification because it communicates directly to the factory how you want your product to be made. Research how some common classroom products are manufactured. What are the processes that factories use to make plastic or metal pieces? What types of machines are used? Which of these processes would work best for your invention?