INNOVATION—INVENTION—INQUIRY

Technological Literacy Units for Grades 5 and 6

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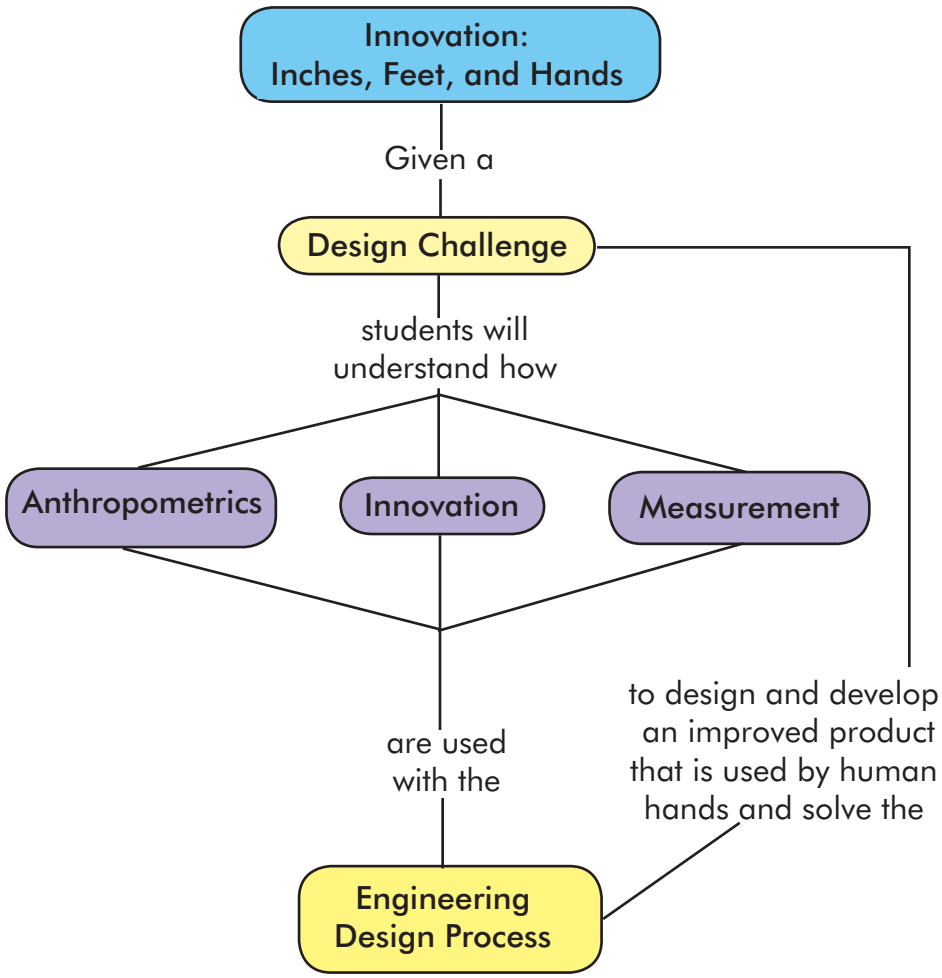
Innovation: Inches, Feet, and Hands

This unit integrates the study of technology, science, and mathematics through the application of anthropometrics by improving the design and development of a new product.



Conducting the Unit

There are five main topics in this unit. Each topic varies in length and scope depending on the schedule and length of the teaching time. Begin each topic with a quote about innovation. A list is provided on page 22. Note: Topics III and IV should be presented as students progress through the Anthropometric Design packet.

Notes:

Topic I: Understanding Innovation (2-3 hours)

1. Have students read through What is Innovation? handout (pages 31 and 32) and try to define the terms: discovery, serendipity, invention, and innovation in their own words. As a class, discuss and show examples of each word and explain how they have had an impact on our society. See the Terminology transparencies on pages 26 and 27.
2. Have students answer the questions on the What is Innovation? worksheet. This can be found on page 33.
3. Show students an example of an innovation timeline. The Teacher's Resources section identifies some potential Web sites on page 13. Have students complete the Innovations from the Past activity unit on pages 34 to 35. The intent of these two activities is to give students an understanding of how technology has influenced our society in the past and how it may impact the future.

Topic II: Anthropometric Innovation Design (2 hours)

1. Define anthropometrics and related terminology. The transparency "Anthropometrics" on page 28 will assist with this discussion.
2. Explain that innovation is a process that requires keen observation, thinking, and doing.
3. Describe an engineering design process (EDP) by using the Engineering Design Process transparency on page 25 and the Engineering Design Process Notes page on page 36. A good way to describe the EDP is to follow the Teaching Innovation section beginning on page 6.
4. Distribute the Anthropometrics design packet on pages 42 to 49 and review it with the class. The purpose of the design packet is to give students an experience innovating a hand product by following the EDP. To prevent haphazard and potentially unsafe practices, students will need to follow the packet rather closely. It is important to remember that most innovators follow such a process because they want to use their time wisely.
5. Review the "Anthropometric Innovation Scoring Rubric" on page 41 with the class.

Answer key for *What Is Innovation?* worksheet

1. Serendipity
2. Innovation
3. Discovery
4. Discovered
5. Invented
6. Innovation
7. Serendipity

8a. S

8b. T

8c. T

8d. S

8e. T

9. Computer chip
   (Did not exist before)
10. Ten-speed bicycle
    (Improved standard bicycle)

Anthropometrics

Background

Anthropometrics is an important aspect of many products that people buy everyday. It is the study of the human form as it relates to product design. A child's glove must be made to the correct size so it can fit without being too big or too small. On a larger scale, anthropometrics is used to design car seats, hats, shoes, computer keyboards,

Activity Information

How do innovators design and develop some of the greatest items in the world? Where do they start? What criteria do they follow when improving an existing product? An innovator's most valuable "tool" is the ability to look at products and figure out ways to make them better. This is called problem solving because people look for a problem and try to solve it. To solve technological problems we use an engineering design process. With this process, anyone can design and produce an idea by following each step carefully and working slowly. This activity is designed to improve your problem solving abilities; specifically related to anthropometrics, measurement, and technology.

An engineering design process is used to provide direction when learning to solve technological problems. As you become more experienced using this process you will find that it becomes more natural.

Hand Products

1. Gloves/Mittens
2. Computer mouse
3. Soda can (to open)
4. Coffee mug
5. Baseball glove
6. Faucet handle
7. Hair brush
8. Screwdriver
9. Video game box
10. Stress ball
11. Grip strengthener
12. Water pitcher
13. Bike brakes
14. Trumpet
15. Door knob
16. Scissors
17. Umbrella
18. Keyboard
19. Puppet
20. Chopsticks
21. Spinning top

Anthropometric Challenge

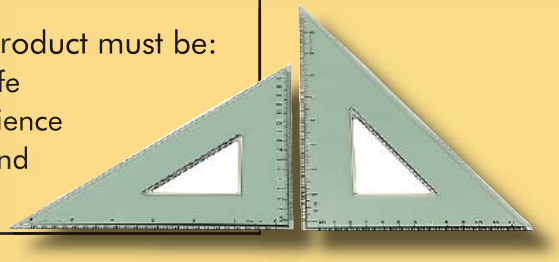
Your challenge is to work with a partner to examine a product that requires the use of someone's hand. A sample list of "hand products" is shown in the box on the left. Find one thing that can be done to improve a product. Then design and make a prototype of the product and show it to the rest of the class. Since this may be the first time you have done this type of activity, it will be important that you follow an engineering design process. The pages that follow will aid you in this process.

Innovation: Improving an existing product to meet a human need or want.

Design Criteria

The anthropometric hand product must be:

- Neatly constructed and safe
- Designed for a target audience
- Supported with sketches and written ideas



How Big Do You Think It Is?

Name: _____ Class: _____

In the previous activity you measured your hand. In this activity, you will be using your hand to estimate the size of different objects. Estimating is a method that is used to get a quick guess of the size of something. Estimating is never as accurate as actually measuring, but it is much quicker. Estimating helps to check if an answer truly makes sense.

With a partner, use your hand to estimate the size of the following objects. Write the approximate size in the column labeled "Estimated Size" for each person. Your answers probably will not be exactly the same. Once all the items are estimated, go back and together measure them accurately with a ruler to the nearest 1/8" (1 mm). Write these sizes in the column labeled "Actual Size."

Item Measured	Estimated size Partner #1	Estimated size Partner #2	Actual Size
1. Length of an unsharpened pencil			
2. Height of your chair seat			
3. Width of your chair seat			
4. Thickness of the top of your desk			
5. Width of a piece of paper			
6. Length of a shoe			

Answer the following questions:

1. Explain how using your hand as a means to estimate can be a good method.

_____

_____

2. If you were to design a new glove for a child who is 10 years old, how would you know what size to make it?

_____

_____