

Modelling the Design Process

Focus: The teacher models the design process to build a pencil holder. Or, if students have experience with the design process, the teacher can guide them through the process of making the pencil holder. This is in preparation for students' final task when they will use the design process to create a useful object.

Specific Curriculum Outcomes

Students will be expected to:

- 31.0 identify problems to be solved [GCO 2]
- 22.0 use appropriate tools [GCO 2]
- 32.0 compare and evaluate personally constructed objects [GCO 2]
- 18.0 communicate procedures and results [GCO 2]
- 30.0 create a product by safely selecting, joining, and modifying materials [GCO 2]
- 7.0 make and record observations and measurements [GCO 2]
- 8.0 communicate while exploring and investigating [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- use a variety of materials to create their own pencil holders
- use tools appropriately and with an awareness of safety
- conserve materials and use materials wisely
- problem-solve effectively to create a form that resembles a pencil holder
- communicate how they built their pencil holder

NOTES:

Attitude Outcome Statements

Encourage students to:

- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]
- work with others in exploring and investigating [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• <i>What Is the Design Process?</i> poster • IWB Activity 9	• sample pencil holder • materials to build and decorate a pencil holder		• design • invent • invention

Safety

- Discuss safety procedures, such as wearing safety goggles when working with tools, before beginning any construction.

Science Background

- The Design Process is a sequence of steps used to solve problems.
- The process can be broken down in four steps:
 1. Identify and describe the problem. Then think of a solution and make a plan.
 2. Gather materials and build a prototype.
 3. Test and evaluate your solution/device.
 4. Share your solution/device and what you learned.

ACTIVATE



The Design Process

Review the steps to the design process using the *What Is the Design Process?* poster. Ask:

- **How does using the design process help us to solve a problem?**

Clarify any questions students may have regarding the process.

CONNECT

Step 1: Identify a Problem, Think of a Solution, and Make a Plan

Tell students that you have a problem. You are having a hard time finding a pencil when you want one because your pencils always end up all over the place. Ask:

- What type of object might help solve my problem?

Lead students to the idea of a pencil holder. Model questions which will help with the design:

- What makes a good pencil holder?
- What should it look like?
- How many pencils should it hold?
- What materials could I use to build one?
- Which materials would be the best?

If necessary, show students a sample pencil holder to discover design ideas. Point out the *What Is the Design Process?* poster and say:

- These are the things I need to think about as I design and build my pencil holder.



Make a Plan: Design

On chart paper or on the IWB, model the thinking process for ‘making a plan.’ Begin by saying: “I want to create a pencil holder to help solve my problem. I think the pencil holder should be able to hold at least ten pencils.” Then ask questions, such as:

- What shape would be the best to hold pencils?
- What easy-to-find materials should I use for my pencil holder design?
- What recycled materials could I use?
- Will my pencil holder hold at least 10 pencils?
- How can I design it so it will stand up without falling over?

Encourage students to ask you questions to help with the design process.

Model drawing several ideas and then choosing the best one. Say: “When I design my pencil holder, I’m going to make several drawings of my ideas, just like Pop did when he designed his magnificent tree. I want my pencil holder to hold at least 10 pencils, to be able to stand up without falling over, and to be attractive to look at. I also want to use recycled materials if I can so that I am helping the environment.”

Materials

Ask students to help you decide what materials you should use. To prompt questions about materials, ask:

- Can I find these items in our classroom?



- **Why do you think it's a good idea to use recycled materials?**
- **What can I use to make the shape I have chosen?**
- **What will I use to decorate the pencil holder?**

Discuss the pros and cons of using various materials for the pencil holder. Ensure students understand that some materials will be more effective than others due to their unique properties.

As you talk about materials introduce terms, such as “bendy” or “flexible,” “firm” or “rigid,” “strong” or “durable.” Add these words to the Word Wall.

Demonstrate how to add labels to your design to indicate the materials you are going to use to create the pencil holder. (Show a rough sketch of a pencil holder with labels, e.g., tall plastic container, ribbon.)

Discuss tools that would be necessary for constructing the pencil holder (e.g., scissors, glue, wire cutters).

Steps for Constructing

On the IWB or chart paper, record the steps of your plan. Use a Shared Writing approach where you and the students co-construct the text. Have students make suggestions as to how to build the pencil holder using the chosen materials. (Although the steps are helpful when building, remind students that sometimes plans change during the building phase.) Remember to model your thinking as you write.

Step 2: Gather Materials and Build a Prototype

Gather the materials needed to build the pencil holder. Then follow the plan to build the pencil holder. Read out each step as you or a volunteer completes it. Ensure that safety goggles are worn when working with tools such as wire cutters, hammer, and so on.

Step 3: Test and Evaluate Your Solution/Device

When the pencil holder is finished, test it. Put the required number of pencils in the holder. Model asking questions as you test it, such as:

- **Does it fit all the pencils I want?**
- **Does the shape suit my purpose?**
- **Will it tip over?**
- **Does it fit on my desk?**
- **Is it attractive (nice to look at)?**

To evaluate the pencil holder, think aloud as you ask yourself questions, such as:

- **Does it work the way I wanted?**
- **Can I improve it?**

- Did I follow my steps accurately?
- Should I have done something differently?

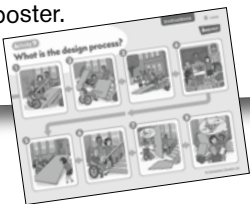
Be sure to point out something that could be improved. For example, “The holder is sturdy and fits my pencils but the plastic container is smooth and it slides on the desk. I think gluing a piece of felt to the bottom would keep my holder from sliding around.” Make the necessary changes, then test and evaluate the holder again.

CONSOLIDATE

Step 4: Share Your Solution/Device and What You Learned

IWB Activity:

- Use Activity 9:
- *What is the design process?* (see the Teacher’s Website)
- to reinforce students’ understanding of the steps in the design process by challenging them to arrange the pictures in order to tell a story about how some students solved a problem using the design process.
- Students may refer to the *What Is the Design Process?* poster.



Talk About the Design Process

Discuss with the students what they learned about the design process. Refer to the *What Is the Design Process?* poster and ask:

- Did we follow the process?
- What could we have done differently to make the pencil holder better?
- Will it be sturdy enough to last a long time?
- Do you have any questions about the process?

Remind students that they will be following the process to build their own useful objects.

